

APPENDIX

A. Auto Rebal Object.doc - Auto Rebal Object

Inputs

Rebalancing Control Variables

Data Source: All parameters from this section will be passed to Auto Rebal when it is called. For PFP, the parameter values will be obtained from the most recent version of the Auto Rebal Parameters Used table entry for the Client Group Id.

Request - Defines the function to be performed. Choices are "is rebal needed" and "rebalance". This variable will be set by PlanIT when the call is done. For phase I, this will always be "rebalance".

Periodic Review - Defines whether the request is for a first time or periodic review. This value will be set by PlanIT when the call is done. For phase I, this will always be "first time".

Client Group Id - A key which identifies the client group for whom Auto Rebal is being run. This key is used to retrieve asset and plan data specific to the client group.

Preferred domain - Choices are stocks "outside" or bonds outside. ("Outside" refers to investments in taxable accounts.)

Use Muni Bonds For High Yield Bonds - Choices are yes and no.

Use Muni Bonds For Long Term Bonds - Choices are yes and no.

Use Muni Bonds For Intermediate Term Bonds - Choices are yes and no.

Use Muni Bonds For Short Term Bonds - Choices are yes and no.

m_MinRetirementFundBalance - Minimum balance required for a retirement account.

M_MinRetailFundBalance - Minimum balance required for a retail account.

m_PortfolioTotalCostPct - Percentage of the total portfolio value that is acceptable as a cost to be incurred when repositioning assets.

Minimum Txn Amount - Minimum dollar amount for any buy or sell transaction.

m_TSMPortfolioToleranceMinus - The acceptable negative variance for the large market and mid/small index holdings for combining these purchases into a purchase of Total Stock Market Portfolio.

m_TSMPortfolioTolerancePlus - The acceptable positive variance for the large market and mid/small index holdings for combining these purchases into a purchase of Total Stock Market Portfolio.

m_TotalIntlPortfolioToleranceMinus - The acceptable negative variance for the foreign developed and emerging market holdings for combining these purchases into a purchase of Total International Portfolio.

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m_TotalIntlPortfolioTolerancePlus - The acceptable positive variance for the foreign developed and emerging market holdings for combining these purchases into a purchase of Total International Portfolio.

m_BusinessArea - VGI Business area requesting auto rebalancing services. Choices are: PFP and PAS.

Carry Forward Loss - Amount of loss incurred by the customer which can be used to offset gains incurred during rebalancing.

Current Year Gains - Amount of gain incurred by the customer in other activities or incurred for the customer during previous rebalancing in the current year which should be included in the total tax cost calculation used as a limit to repositioning of assets.

m_RoundingTo - Rounding parameter for all calculated values. Choices are to the nearest \$1 or nearest \$100.

Tax Rate Used For Calculating Tax Cost - Tax rate, expressed as a decimal amount, to be used when estimating the tax cost incurred in rebalancing the portfolio. Current values would be .10 or .20.

m_SAAPeriodicVarianceMinus - The acceptable negative variance from the target SAA amount when determining whether or not rebalancing is needed. Used for PAS on periodic review.

m_SAAPeriodicVariancePlus - The acceptable positive variance from the target SAA when determining whether or not rebalancing is needed. Used for PAS on periodic review.

m_SAAVarianceMinus - The acceptable negative variance from the target SAA when determining whether rebalancing is complete.

m_SAAVariancePlus - The acceptable positive variance from the target SAA when determining whether rebalancing is complete.

Estimate Tax Cost - Flag to indicate whether tax cost should be estimated for the purpose of determining whether to sell an asset. Possible choices are yes and no.

Estimate Tax Cost Asset % - Percentage of current asset value that should be used to estimate tax cost. This field is only valid if Estimate Tax Cost is yes. Field should be supplied as a decimal amount, <= 1.

m_PortfolioTilt - Type of portfolio being used for the rebalancing. Valid choices are NO= core, IN = income, and TE = tax efficient.

m_TacticalShift - The amount by which stock allocations should be decreased and bond allocations increased. Acceptable values are .05, .10, and 0.

Portfolio Number - The portfolio selected for the client based on their Ibbotson score. The value may have been modified by the counselor. Valid values are 1 through 7.

m_TaxAcctDCAFund - The Vanguard fund number identifying the fund to be used in taxable plans for dollar cost averaging, as an intermediate fund between sells and buys, or as a cash investment. This fund will also be used if the total buy amount in a taxable plan can not be successfully invested in a target fund.

D E S I G N A T I O N

Produce Explanations - This is a yes/no flag indicating whether explanations for changes to the proposed portfolio should be produced by the system. If the flag is set to yes, the explanations should be created.

The following constant values are used to control the rebalancing process. These constants are stored in table `tpfs302` as parameters for the SYS business area. These constants are described elsewhere in this design and specify the current value for the parameter. However, the code should retrieve the actual values from the data base.

Max # of Assets - integer value

Max # of Constraints - integer value

Required Buy Variables - integer value

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Target Portfolio

Data Source: The target portfolio is stored in tables tpfs106 and tpfs107.

A list of lowest level asset classes and associated percentage amount expressed as a decimal. The total of the percentages for all asset classes must equal 1.

There are separate taxable and tax exempt versions of the portfolios. If the tax exempt version is used, the actual purchases may be in taxable funds depending on whether the client should be using tax exempt funds for that bond duration and whether the type of account in which the purchase is being done permits the use of municipal bonds.

The target portfolio is stored by business area, portfolio number, portfolio tilt, and muni bond use.

Example:

S7	.32
S8	.13
S9	.55

Investment Assets

Data Source: The information for these fields will come from the data entered on the investment assets and retirement plan screens. When the Analysis function is requested, PlanIT will extract this data and load it to the new Rebalancing Assets table. The Rebalancing Assets table will be the source of this data for Auto Rebal.

Note: Asset # needs to be sequentially assigned. This does not correspond to anything within PlanIT. This field is used to identify the asset uniquely to the LP engine. This will be done by the stored procedure which retrieves the data from the data base.

Note: Plan # is a sequentially assigned number to keep asset groupings unique. This will be assigned by the stored procedures which extract the data from the questionnaire at the start of the analysis function.

Note: Hold amount should come from PlanIT to allow part, not all of an asset to be specified as held. This capability is provided because of the need for a cash carve out. This would allow the counselor to specify part of the client's cash balance be retained. The cash asset could then be specified as repositionable and the retained portion would be kept. If there was a cash allocation in the portfolio, the held portion would be used to satisfy this. This partial hold won't work until we go to maybe repositionable assets.

Note: Repositionable flag settings are not valid for PAS. An additional field on the investment and retirement plan entry will be needed to specify this information when PAS is implemented.

A list of all assets to be included in the rebalancing. For each asset, the following information must be provided:

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Asset # - Sequentially assigned number to uniquely identify an asset. Additional assets can be returned with the output.

Plan # - A number which identifies the plan to which the asset belongs.

VGI Fund # - The fund number used to identify a Vanguard fund.

VGI Fund Flag - A flag to indicate that the asset is a Vanguard fund.

Title

Current Amount - The current value of the asset in whole dollars.

Hold Amount - The amount of the asset to be retained in whole dollars. For a non-repositionable asset, this would equal the current amount. For a maybe or yes repositionable asset, this can be any amount ≥ 0 and \leq current amount.

Cost Basis - The total cost basis for the asset in whole dollars. If tax cost is unknown, this field should contain nulls.

Fee Amount - The amount in dollars which would be incurred if the asset is sold. Nulls in phase 1.

Loan Amount - For a retirement plan asset, the dollar amount that is not available for repositioning because it is loaned. This amount must be \leq Current Amount and \leq Hold Amount.

After Tax Balance - For a retirement plan asset, the dollar amount that represents after tax contributions. This amount must be \leq Current Amount.

Repositionable Flag - Flag to indicate whether the asset can be repositioned. Choices are:

Yes - definitely sell the asset

No - do not sell the asset

Maybe - asset may be sold to meet the target allocation percentages

Minimum Balance - The minimum amount allowed in this fund. This will be either the retail or retirement minimum, depending on the type of plan to which this account belongs.

Asset Class Breakdown - The asset classes and associate percentages which make up the asset. These asset classes must be at the lowest level of the asset hierarchy. Percentages are expressed as a decimal amount. All percentages must add up to 1. For each asset class, an asset class code and amount must be provided.

Example 1:

S7 1.00

Example 2:

S7 0.60

B2 0.40

If the number of assets retrieved for a plan exceeds the control parameter for maximum assets, exit with an error; auto rebal can not be run.

Investment Plans

Data Source: New PlanIT table, Investment Money Pools. When the Analysis function is requested in PlanIt, PlanIT will extract this data from the existing tables and create the new table.- For retirement plans, most of this data will come from the Retirement Plan entry screen.

Note: Plan # is a sequentially assigned number to keep asset groupings unique. For retirement plans, this could be the plan # (1,2, etc.) identified on the entry screen. However, there also must be dummy plans created for any ownership type defined for the investment assets. e.g. a plan would be created for joint/spouse and a separate plan for the husband's individual accounts. The stored procedure which extracts this data into the Investment Money Pool table will assign the pool #.

A list of all plans to which the investment assets belong. A plan is a grouping of assets by owner and account type. For example, it could represent all of the assets owned jointly with the spouse or a husband's IRA accounts. It is not an individual account or registration.

For each plan, the following data must be supplied:

Plan # - Sequentially assigned number to uniquely identify a plan. Limited to 99 (existing plus any that would be added due to repositioning an existing plan to a different type).

Type - For retirement plans, this is the type of plan. Available choices are: 401(K), 403(B), 457, Qualified Annuity, Non-qualified Annuity, ESOP, KEOGH, Money Purchase Plan, Profit Sharing, Roth IRA, SARSEP, SEP IRA, SIMPLE IRA, Stock Bonus, Traditional IRA, and Rollover IRA. For non-retirement plans (taxable), this will contain spaces.

Owner - The owner of the plan.

Reposition To Plan # - The plan # to which the repositioned assets should be moved. If the plan assets are being repositioned within the plan, this field will contain the plan #. Must specify a number which corresponds to one of the supplied plans.

Restricted Investments - A flag to indicate whether the investment choices for the plan are limited. Choices are yes and no.

Tax Status - Taxable or tax deferred.

If the number of plans retrieved exceeds the control parameter for maximum plans, exit with an error; auto rebal can not be performed.

Primary Fund List

Data Source: New Preferred Fund Class, Preferred Funds, and Alternate Funds tables containing preferred and alternate funds.

This is a list of the preferred and alternate funds to be used as investment choices in plans which do not have restricted funds. At least one investment choice should be provided for each asset class in the target portfolio. Each entry in the list should contain the following information:

Asset class

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Preferred/alternate (P = preferred, A = alternate)
VGI fund number
Fund Id
Title
Minimum Retail Balance
Minimum Retirement Balance
Split Fund # - A number (0 through 9) used to differentiate between multiple funds when purchases should be split between multiple funds. 0 indicates the buy goes to a single fund.
Split Rate - A rate used to specify the portion of an investment that should go to a given fund when the purchase should be split between multiple funds. Maximum amount is 1.00.
Format is 9.99. Split rates for the preferred funds for a single asset class must add up to 1.00.

Fund List For Tax Efficient Portfolio

Data Source: New Preferred Fund Class, Preferred Funds, and Alternate Funds tables containing preferred and alternate funds.

A separate list of preferred funds to be used in taxable accounts if the portfolio tilt is tax efficient. Each entry in the list should contain the following information:

Asset class
Preferred/alternate (P = preferred, A = alternate)
VGI fund number
Fund Id
Title
Minimum Retail Balance
Minimum Retirement Balance
Split Fund # - A number (0 through 9) used to differentiate between multiple funds when purchases should be split between multiple funds. 0 indicates the buy goes to a single fund.
Split Rate - A rate used to specify the portion of an investment that should go to a given fund when the purchase should be split between multiple funds. Maximum amount is 1.00.
Format is 9.99. Split rates for the preferred funds for a single asset class must add up to 1.00.

Restricted Investment Plans Fund Selections

Data Source: New Master Restricted Investment Alternatives table containing the restricted funds for a plan. The data is stored once in PlanIT for a given plan (e.g. Texaco's 401(K)). However, there can be multiple plans (e.g. husband and wife both belong to Texaco's 401(K) plan) within the data needed by Auto Rebal that point to the same list of restricted funds. The same data would be repeated for each of these plans.

This is a list of the investment choices available to a plan with restricted investment alternatives. For each investment available to a restricted plan, the following information should be provided:

Restricted Plan Id - identifies the restricted plan for which the investments should be used
Limited to a maximum of 99.
Restricted asset # - A sequentially assigned number to uniquely identify an asset within a plan.
Limited to a maximum value of 99.

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Asset # - Uniquely identifies an asset within the plan alternatives. A sequentially assigned number within the plan which starts at 1 for each plan.

Asset Class Breakdown - The asset classes and associate percentages which make up the asset. These asset classes must be at the lowest level of the asset hierarchy. Percentages are expressed as a decimal amount. All percentages must add up to 1. For each asset class, an asset class code and amount must be provided. Up to 40 asset classes can be specified.

Minimum Retail Balance - The minimum amount that can be in this fund if the account is in a taxable plan.

Minimum Retirement Balance - The minimum amount that can be in this fund if the account is in a non-taxable (retirement) plan.

VGI fund number - only provided for Vanguard funds (may be blank)

VGI Fund Flag - A flag to indicate that a fund is a Vanguard fund.

Fund Id - The id of the fund on the PlanIT data base.

Title

Asset Hierarchy

Data Source: Data is in TPFS009.

A list of the available asset classes and how they relate to each other. Only investment asset classes should be included in the hierarchy. The top level of the hierarchy must be IV, for investment. Each entry in the list must contain an asset class, a parent asset class, and a flag to indicate whether it should be included in the rebalancing process. An asset class can be included in the hierarchy for defining assets, but rebalancing can be done at a higher level. Holdings in child asset classes would be combined to determine the holdings at the level where rebalancing is done. IV should not appear as an asset class, only as a parent asset class.

Example:

asset class	parent asset class	Rebalancing Level
SA	ST	Y
ST	IV	Y
S2	SA	Y
S7	S2	N
S8	S2	N
S9	S2	N

Purchase Hierarchies

Data Source: New Purchase Preferences data base table.

The order in which asset classes should be purchased. Separate hierarchies should be provided for the following categories: bonds outside, stocks outside, bonds "inside", stocks inside, Roth, and annuity. Each purchase hierarchy should consist of the complete set of lowest level asset classes which should be purchased, listed in descending preference order. For example, the bonds outside hierarchy would start with bonds but would have stock asset classes listed after the bonds. ("Inside" refers to within a tax sheltered plan. For example, an IRA.)

For the purpose of investment order, bond groups which split into a choice of taxable or tax exempt must include both sets of asset classes. The actual class used would be based on whether municipals should be purchased for the bond group and the whether the type of account in which the purchase is done offers a municipal selection.

Only asset class would be input to the auto rebalancing process. Description is included in the list for information purposes. Also, some asset classes have not yet been added to the asset hierarchy, so the code is not yet known.

Vanguard Funds Not Wanted

Data Source: New PlanIT table.

A list of Vanguard fund numbers that the customer does not want to own.

Equivalent Asset Class Table

Data Source: New PlanIT table. The entire table would be read into storage.

Asset Group - The asset group to which an asset class belongs. This code does not need to correspond to any asset class code. It is used simply to group common entries in the table.

Asset Class Code - The asset class code which varies depending on some client criteria. For the initial implementation, asset allocations would switch between municipal bond asset classes and taxable bond asset classes depending on whether the client should be using municipal bonds for their portfolio and whether the investment is being done in a taxable account.

Tax Status - Indicates whether the investment is taxable or non-taxable. Valid values are TX = taxable, NT = non-taxable.

Bond Term - A code to indicate the type of bond. Valid values are HY = high yield, LT = long term IT = intermediate term, ST = short term, and blanks = not applicable.

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Outputs

Always Returned

The following data fields are always returned from the auto rebalancing object:

Status - Indicates whether requested function completed successfully. Values are:

Status Code	Meaning
YR	Rebalancing is needed
FS	Rebalancing failed in sell linear programming process
FB	Rebalancing failed in buy linear programming process
FR	Final Report run (set by PlanIT)
SE	Request too large for sell linear programming process
BE	Request too large for buy linear programming process
NR	Rebalancing is not needed
SR	Rebalancing was completed successfully
BR	Bad request code sent
PC	Analysis canceled in PlanIT (set by PlanIT)

Optional Data Returned - Indicates whether optional output data was returned. Choices are yes and no.

For status codes Y or N, no other output data would be provided. For other status codes, rebalancing may have been partially completed.

Optional Output

The following data may or may not be returned. If the optional data returned flag indicates no data was returned, none of this data is returned. If the optional data returned flag indicates data was returned, all types of data will be returned.

Investment Assets

Update the Rebalancing Assets table with this data. For assets that were input, buy amount, sell amount, proposed amount, tax cost, and fee cost fields would be updated. For new assets, added by the rebalancing process, a new row containing the fields shown would be added to the table.

A list of all assets after rebalancing. All input assets will be returned, followed by the assets added by the rebalancing process. For each asset, the following information must be provided:

Asset # - Sequentially assigned number to uniquely identify an asset. For assets which were input, this is the number supplied. For new assets, this is a sequentially assigned number beginning with the last number used on an input asset + 1.

Plan # - A number which identifies the plan to which the asset belongs.

Asset Class Breakdown - The asset classes and associate percentages which make up the asset.

VGI Fund # - The fund number used to identify a Vanguard fund. (May be blank).

VGI Fund Flag - A flag to indicate that the investment is a Vanguard fund.

Title - Fund name or description of an individual stock or bond. .

Current Amount - The current value of the asset in whole dollars. For input assets, this is the amount which was supplied. For new assets, this field would contain zeros.

Buy Amount - The amount of the asset which should be purchased.

Sell Amount - The amount of the asset which should be sold.

Proposed Amount - The amount of the asset which should be held in the proposed portfolio. Current amount + buy amount - sell amount = proposed amount.

Explanations

Update the new Explanations table in the PlanIT data base, adding a row for each message created.

Text messages explaining why different rebalancing decisions were made.

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Work Fields Which Must Be Accessible By Multiple Modules Within The Auto Rebal Object

This section defines work data fields which are needed by the Auto Rebal Object. These fields are temporary storage areas for information which exist only for the instance of the Auto Rebal Object. These fields are created and populated by the Auto Rebal Object. When the object completes, the work fields should cease to exist. The contents are unique to a given instance of the Auto Rebal Object.

Asset Gain Amount - Dollar amount gained on an asset since it was purchased. This amount may be an estimate. Created by Develop Gain/Loss For Each Input Asset.

Asset Loss Amount - Dollar amount lost on an asset since it was purchased. This amount may be an estimate. Created by Develop Gain/Loss For Each Input Asset.

Last Used Asset # - Highest asset number currently assigned to an asset. This number is used to assign a unique identifier to any asset added to the portfolio during rebalancing. Created By Initialize Output Investment Assets.

Model File - A sequential file of equations to be used by the LP processing engine to determine the asset classes in which purchases should be done.

Alternate Asset Class Table - This table identifies the taxable asset class codes and percentages to be used for a tax exempt class when the tax exempt class is not applicable. Each row of the table will have the following data fields:

Tax Exempt Bond Class - The tax exempt asset class code which may be replaced by the taxable alternative.

Amount Moved To Taxable Class - The amount of money reallocated from the desired tax exempt asset class to the alternative taxable class.

Alternate Class Count - The count of the alternate taxable asset classes which should be used in place of the Tax Exempt Bond Class. No entry should have an alternate class count < 1.

Alternate Class Array - An array of the alternate taxable asset classes. The number of entries in the array corresponds to the Alternate Class Count. Each entry in the array has the following fields:

Asset Class - A taxable asset class code.

Asset Class Percent - The percentage, expressed as a decimal value, of the total portfolio represented by the asset class code. A value of 10% would be stored as .10.

Note: Logic within the Auto Rebal Object will look for values in this table even when it may not have been created. It will need to either be able to recognize an "empty" table or have a flag to say the table can not be checked.

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Perform Is Rebalance Needed? (*Is Rebalance Needed?* must have access to all input data passed by the calling program.)

ELSE

Perform Is Rebal Needed

Perform Rebalance Portfolio (Process defined in a separate document. The called process must have access to all data passed to this module and will create the output data if it is successful.)

ELSE

END IF

Return to the calling program with Status = BR and Optional Data Returned Flag = NO.

Is Rebal Needed?

IF Use Muni Bonds For High Yield Bonds = yes

or Use Muni Bonds For Intermediate Term Bonds = yes

Perform Get Taxable Bond Class Allocations (defined in Rebalance Portfolio)

Perform Determine Taxable Bond Allocation (defined in Rebalance Portfolio)

Perform Switch Target Portfolio Allocations (defined in Rebalance Portfolio)

END_IF

Develop Current Portfolio Amounts

Develop Target Portfolio Amounts

Develop Adjusted Target Amounts

Go through all Investment Assets.

IF at least one investment asset has a Repositionable Flag of YES or MAYBE

IF PAS and periodic review

Initialize Status to NR

Locate each of the SAA sub-totals created in the Develop Current Portfolio Amounts and do the following:

Locate the corresponding SAA target in the Adjusted Target Portfolio

If the SAA amount in the current portfolio < $[(1 - m_SAAPeriodicVarianceMinus) * SAA \text{ adjusted target amount}]$ rounded based on $m_RoundingTo$
OR SAA amount in the current portfolio > $[(1 + m_SAAPeriodicVariancePlus) * SAA \text{ adjusted target amount}]$ rounded based on $m_RoundingTo$.

Set Status to YR

END_IF

When all SAA amounts have been checked, return the Status

ELSE

Return Status = YR

END_IF

ELSE

Return Status = NR

END_IF

Get Target Portfolio Allocation Rates

IF Use Muni Bonds For High Yield Bonds = Yes

or Use Muni Bonds For Long Term Bonds = Yes

or Use Muni Bonds For Intermediate Term Bonds = Yes

or Use Muni Bonds For Short Term Bonds = Yes

set Tax Status = NT

ELSE

set Tax Status = TX

END_IF

Call stored procedure Retrieve Target Portfolio to retrieve the allocations from the data base. Use the Portfolio Number, $m_PortfolioTilt$, tax bracket = HI, and tax status determined above as the key values passed to the stored procedure.

Develop Current Portfolio Amounts

For each input asset create/update a sub-asset class total for the portfolio for current amount and hold amount:

Zero current amount and hold amount accumulator fields for the asset.

For asset class (a) associated with the asset for $a=1$ to $a=n-1$:

Compute work asset amount = current amount (a) * asset class percent (a) rounded to the nearest 100.

Compute work hold amount = hold amount (a)/current amount (a) * asset class percent (a) rounded to the nearest 100.

Current amount accumulator = current amount accumulator + work asset amount.

Current hold amount accumulator = current hold amount accumulator + work hold amount.

Locate asset class totals for asset class (a)

IF total is found, add work asset amount to asset class total-current amount, add work hold amount to asset class total-hold amount

ELSE

create an asset class total area for asset class (a) with asset class total-current amount = work asset amount and asset class total-hold amount = work hold amount

END_IF

For asset class (a) associated with the asset for a=n:

Work asset amount = current amount (a) - current amount accumulator.

Work hold amount = hold amount (a) - current hold amount - hold amount accumulator.

Locate asset class totals for asset class (a)

IF total is found, add work asset amount to asset class total-current amount, add work hold amount to asset class total-hold amount

ELSE

create an asset class total area for asset class (a) with asset class total-current amount = work asset amount and asset class total-hold amount = work hold amount

END_IF

Develop sub-total for higher level asset classes and SAA's:

For each asset class total created, find the parent asset class.

IF the parent class is not = IV, locate the sub-totals for this parent class

IF the sub-totals are found, add the asset class total for the current amount and hold amount to the corresponding sub-total fields

ELSE create the sub-total for the parent asset class with the sub-total amounts for current amount and hold amount equal to the values from the asset class total

END_IF

Keep going up the asset hierarchy for the current asset sub-total until the asset class with IV for the parent is located. Then go on to process the next asset class total.

END_IF

Develop Target Portfolio Amounts

- Go through each asset class in the target portfolio, provided as input, to identify all the parent classes up to the SAA level (SAA is the class for which the parent class is IV).
- Get sub-total percentages for each SAA and sub-asset class grouping.
- Work through the target portfolio, following the asset hierarchy from higher to lower levels, to develop target amounts for each category. (i.e. First level for which targets are calculated will be the SAA.)
 - For all entries within the level, except the last, target allocation amount = (target percentage / sum of the target percentages for the hierarchy grouping) * the allocation at the higher level of the asset hierarchy. Round the result to the nearest dollar or hundred dollar depending on the value of the input rounding parameter.
 - For the last item within a hierarchy grouping, the target allocation amount = (total amount for the category - the sum of the target allocation amounts for the other items within the category).

Example:

SAA allocations are 10% cash reserves, 80% bonds, 10% stocks. Bond allocations are 8% intermediate term, and 72% short term. The rounding parameter is round to the nearest \$100. Total portfolio amount is \$500,150.

SAA allocations:

Cash reserves = $(.1 / 1) * 500,150 = 50,015$ which rounds to 50,000

Bonds = $(.8 / 1) * 500,150 = 400,120$ which rounds to 400,100

Stocks = $500,150 - (50,000 + 400,100) = 50,050$

Bond allocations:

Intermediate Term = $(.08 / .8) * 400,100 = 40,010$ which rounds to 40,000

Short Term = $400,100 - 40,000 = 360,100$

Develop Adjusted Target Amounts

Working from higher to lower levels within the asset hierarchy, determine adjusted target amount for each of the asset categories and sub-totals.

SAA Targets

- Initialize adjustment needed to zero.
- Repeat for each SAA within the target portfolio.

IF hold amount for the SAA in the current portfolio exceeds the target amount

Adjusted target amount = hold amount for the class in the SAA.

IF Produce Explanations = yes

Record an explanation that target amount was adjusted due to non-repositionable assets.

END_IF

Add (hold amount for the class - target amount for the class) to adjustment needed.

ELSE

Adjusted target amount for the class = target amount for the class

END_IF

- Repeat for each SAA within the current portfolio:

IF class in the current portfolio is not in the target portfolio

Add the class to the adjusted target portfolio. Adjusted target amount = hold amount from the current portfolio.

IF Produce Explanations = yes

Record an explanation that the target amount of zero was adjusted due to non-repositionable assets.

END_IF

Add the hold amount for the class to adjustment needed.

END_IF

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- If adjustment needed > 0, spread among other asset classes at the same level of the hierarchy based on the ratio of the asset class to the other asset classes which can be adjusted. Set Explanation Recorded Flag to NO. Repeat the following process until adjustment needed = 0:
 - Adjustment applied = 0.
 - Get the sum of the percentages for all adjusted target portfolio SAA entries where the adjusted target amount is greater than the hold amount for the class.
 - Repeat for all SAA entries in the target portfolio:
 - IF adjusted target amount > hold amount for the class
 - Adjustment amount = (target % for the class/sum of percentages obtained earlier) * adjustment needed. The result is rounded to the nearest dollar or hundred dollars based on the rounding parameter.
 - Adjustment remaining = (adjustment needed - adjustment applied)
 - IF adjustment remaining < \$100
 - Adjustment amount = adjustment remaining
 - END_IF
 - IF adjustment amount > (adjusted target amount - hold amount for the class)
 - adjustment amount = (adjusted target amount - hold amount for the class)
 - END_IF
 - Adjusted target amount = (adjusted target amount - adjustment amount)
 - Add adjustment amount to adjustment applied.
 - IF Explanation Recorded Flag = NO
 - IF Produce Explanations = yes
 - Record an explanation that the target was adjusted due to non-repositionable assets in another asset class.
 - END_IF
 - END_IF
 - END_IF
 - Adjustment needed = (adjustment needed - adjustment applied). Adjustment applied = 0.
 - Explanation Recorded Flag = YES

Example:

	Target Amount	Non-Repo Asset Amount	Current Amount
Cash	50,000	51,000	60,000
Bonds	400,100	0	50,000
Stocks	50,050	0	390,150

Adjusted cash target = 51,000
Adjusted cash minimum = 50,000
Adjusted cash maximum = 52,500

Adjustment to spread = $51,000 - 50,000 = 1,000$

Bond adjustment = $(.8 / .9) * 1,000 = 889$ which rounds to 900

Stock adjustment = $1000 - 900 = 100$

Adjusted bond target = $400,100 - 900 = 399,200$

Adjusted bond minimum = 391,200

Adjusted bond maximum = 411,200

Adjusted stock target = $50,050 - 100 = 49,950$

Adjusted stock minimum = 49,000

Adjusted stock maximum = 51,400

Variance = current amount - adjusted target amount

Cash variance = $60,000 - 51,000 = +9,000$

Bond variance = $50,000 - 399,200 = -349,200$

Stock variance = $390,150 - 49,950 = +340,200$

Non-Stock Sub-asset Categories

For SAA's other than stock,³ continue working down the asset hierarchy to calculate the amounts for each asset class at that level in the same way as described for the SAA's. The amount to be allocated at each sub-level is the amount allocated at the prior level. The percentage weighting for each asset class within the group is the percentage assigned to that group divided by the sum of the percentages in the group.

Stock Sub-asset Categories

The allocations for the first level of the stock SAA is different than other SAA groups. The process to be done is as follows:

- The allocation for the foreign stocks (S0 asset category) is the target amount calculated previously.

IF foreign target amount > adjusted target stock SAA amount

S0 adjusted target allocation = adjusted target SAA amount

IF Produce Explanations = yes

Record an explanation that the foreign allocation was reduced due to non-repositionable assets in other asset classes.

END_IF

END_IF

The intent is to try to allocate the entire desired foreign allocation, regardless of the other stock holdings.

- US stock allocation = (adjusted stock SAA target amount - S0 adjusted target allocation)

³ Stock investments are part of SAA ST.

- IF (hold amount for stock SAA - hold amount for S0 asset class) > US stock allocation
 US stock allocation = (hold amount for stock SAA - hold amount for S0 asset class)
 S0 adjusted target allocation = (stock SAA adjusted target allocation - revised US stock allocation)
 IF Produce Explanations = yes
 Record an explanation of the change to the foreign allocation.
 END_IF
 END_IF
- Within the foreign stock asset class, calculate the group breakdowns for lower asset levels in the same manner as described previously for the SAA's
- For the US stocks group, determine the current non-repositionable amount in "other" US stocks. This would be the amount in any asset groups other than large US (asset class S2) and mid/small US (asset class S3). (The amount would currently be the amount of individual stock holdings. However, the process should not assume this to allow for other asset classes which Vanguard will not include in the target portfolio to be added to the hierarchy.)

 Add this allocation amount to the adjusted target portfolio by copying the various asset groups which comprise it from the current portfolio. The allocation amount for each class within this group would be only the hold amount for the class.
- IF the "other" stock allocation amount > 0
 US target allocation amount = (US target allocation amount - "other" stock allocation amount)
 IF Produce Explanations = yes
 Record an explanation that the US stock allocation was reduced due to non-repositionable holdings in other stocks.
 END_IF
 END_IF
- The resulting US stock target allocation amount is the total to be split between the large US (S2) and mid/small US asset groups (S3). The allocation between these two groups should be done as previously described for the SAA and other asset groups.
- Sub-class breakdowns for large US and mid/small US are done in the same manner as for other asset classes.

Example 1

Stock SAA adjusted target allocation = \$50,000

Stock SAA hold amount = \$30,000

S0 target % = .06

S0 hold amount = \$3,000

Total portfolio value = \$900,000

S1 (individual stocks) hold amount = \$5,000

S0 adjusted target allocation = .06 * 900000 = 54000

S0 adjusted target allocation is greater than the stock SAA target allocation, so S0 adjusted target allocation = 50,000

US stock allocation = (stock SAA adjusted target allocation - S0 adjusted target allocation) = (50000 - 50000) = 0

US stock allocation < (stock SAA hold amount of 30000 - S0 hold amount of 3000), so the US stock allocation is changed to the difference between the two amounts, \$27,000.

S0 adjusted target allocation = (stock SAA adjusted target allocation - US stock allocation) = (50000 - 27000) = 23000.

Example 2

Stock SAA adjusted target allocation = \$50,000

Stock SAA hold amount = \$6,000

S0 target % = .06

S0 hold amount = \$3,000

Total portfolio value = \$300,000

S1 (individual stocks) hold amount = \$1,500

S2 (large US stocks) % = .32

S2 hold amount = \$1,500

S3 (mid/small US stocks) % = .13

S0 adjusted target allocation = .06 * 300000 = 18000

S0 adjusted target allocation is less than the stock SAA target allocation, so S0 adjusted target allocation is not changed.

US stock allocation = (stock SAA adjusted target allocation - S0 adjusted target allocation) = (50000 - 18000) = 32000

US stock allocation > (stock SAA hold amount of 6000 - S0 hold amount of 3000), so the US stock allocation is unchanged

US stock allocation = (US stock allocation - "other" stock hold amount) = (32000 - 1500) = 30,500

Total group percent = S2% + S3% = .32 + .13 = .45

S2 adjusted target allocation = (S2% / total group %) * US stock allocation = (.32 / .45) * 30500 = 10844.
Rounded to the nearest \$100, S2 adjusted target allocation = 10800.

S3 adjusted target allocation is the last allocation of the group, so S3 adjusted target allocation = (US stock allocation - S2 adjusted target allocation) = (30500 - 10800) = 19700.

B. Rebalance Portfolio.doc - Auto Rebal Object - Rebalance Portfolio

Inputs

This module must have access to all input passed to the Auto Rebal Object. This data is defined in Auto Rebal Object.doc.

Outputs

This module must be able to populate all data identified for the Auto Rebal Object. This data is defined in Auto Rebal Object.doc

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Main Flow

Initialize Status to SR

Review all input assets

IF there is any maybe repositionable assets

 Develop Gain/Loss For Each Input Asset (*Creates a gain and a loss amount for each input asset.*

These fields must be accessible by other routines.)

 Perform Determine How Much Of Each Current Asset To Sell And/Or Hold

END_IF

IF Status = SR

 Perform Determine How To Invest Proceeds From Asset Sales (defined in Determine Investments.doc)

END_IF

Return to the calling module with Status, Optional Data Returned Flag, and optional data fields populated by the called modules.

Develop Gain/Loss For Each Input Asset

For each investment asset, determine a gain amount and a loss amount.

IF plan to which the asset belongs is tax exempt

 work cost = Current Amount

ELSE

 IF Cost Basis Flag = "not known"

 IF Estimate Tax Cost = Y

 Compute work cost = (Current Amount * Estimate Tax Cost Asset %). The result
 should be rounded to the nearest dollar or \$100 based on m_RoundingTo.

 ELSE

 work cost = 0

 END_IF

 ELSE

 work cost = Cost Basis

 END_IF

END_IF

IF work cost < current asset value

 asset loss amount = 0

 asset gain amount = current asset value - work cost

ELSE

 IF work cost > current asset value

 asset gain amount = 0

 asset loss amount = work cost - current asset value

 ELSE

asset gain amount = 0
asset loss amount = 0
END_IF
END_IF

Get Taxable Bond Class Allocations

This routine gets an alternate set of target portfolio allocations. This alternate set is the version which uses taxable bonds. This version is required since a client may not be using municipal bonds for all classes of bonds or may be buying bonds in a plan type which does not allow municipal bonds and will therefore need to allocate the bond purchase in the same manner as done for the taxable portfolio.

In these situations, the allocation for a bond class (short term, intermediate term, etc.) would remain the same as in the municipal bond version of the portfolio. However, investments would be done using the taxable asset class. In some cases, this change will just be a switch of asset class code. In others, the taxable investment is split between multiple asset class codes (e.g. active and passive investments). In this situation, the class allocation will remain the same as in the municipal portfolio, but will be split in the same ratio as for the taxable allocations.

Use stored procedure Retrieve Target Portfolio to retrieve the alternate target portfolio percentages. Use Portfolio Number, m_PortfolioTilt, tax bracket = HI, and tax status = TX as the keys passed to the procedure. Store the returned asset class codes and associated percentages as an alternate target portfolio.

Determine Taxable Bond Allocation

This procedure determines the taxable allocation to be used for a municipal bond allocation in the target portfolio. This alternate allocation may be used for all investments in the bond class or for investments in the class when the tax exempt investment is not appropriate.

For each asset class in the target portfolio, do the following:

Match the asset class code from the target portfolio to the asset class codes in the Equivalent Asset Class Table.

IF there is a match and the Tax Status for the matching table entry is NT (non-taxable)

Look for the taxable alternate class in the Equivalent Asset Class Table, using the Asset Group from the matching entry and Tax Status of TX (taxable) as keys.

IF a match is found

Search for the Asset Class from the new matching entry in the alternate target portfolio

If the Asset Class is in the alternate target portfolio, it is a substitution for the existing target portfolio asset class

Create an entry in the Alternate Asset Class Table with the following values:

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Tax Exempt Bond Class = Asset Class from the target portfolio which started this process

Amount Moved To Taxable Class = 0

Alternate Class Count = 1

One Alternate Class Array entry with the Asset Class = Asset Class from the new matching entry and Asset Percent = the percent for the Asset Class entry in the target portfolio

ELSE

Locate all child asset classes within the asset hierarchy for the Asset Class of the new matching entry.

IF there are no child classes or any is marked as not included in rebalancing go on to check the next asset class entry in the target portfolio

ELSE

For each child class, do the following:

Search for the child class in the alternate target portfolio.

If the child class is in the alternate target portfolio

IF first matching child

Create an entry in the Alternate Asset Class Table with the following values:

Tax Exempt Bond Class = Asset Class from the target portfolio which started this process

Amount Moved To Taxable Class = 0

Alternate Class Count = 1

One Alternate Class Array entry with the Asset Class = Asset Class from the new matching entry and Asset Percent = the percent for the Asset Class entry in the alternate target portfolio

ELSE

Update the existing entry in the Alternate Asset Class Table for the Tax Exempt Bond Class = Asset Class from the target portfolio which started this process. Do the following:

Add 1 to Alternate Class Count

Add an additional Alternate Class Array entry with the Asset Class = child class and Asset Percent = the percent for the child class entry in the alternate target portfolio

END_IF

ELSE

Locate and children of the child class being processed in the asset hierarchy and add these additional children to the list of child asset classes to be checked.

END_IF

When all child classes have been checked,

IF an Alternate Asset Class Table entry was created for the Asset Class from the target portfolio which originally started this process

Adjust the Asset Percents for the entries in the Alternate Class Array by doing the following:

Compute Percent Total = Sum the asset percents for all entries in the Alternate Class Array.

Compute the adjusted Asset Percent for each entry = (Asset Percent / Percent Total) * percent for the Tax Exempt Bond Class in the target

portfolio. Round the percents as needed. However, insure that the sum of the entries in the array = the percent for the Tax Exempt Bond Class in the target portfolio.

```
ELSE
    go on to process the next asset class in the target portfolio
END_IF
END_IF
END_IF
ELSE
    go on to check the next asset class entry in the target portfolio
END_IF
ELSE
    go to check the next asset class in the target portfolio
END_IF
```

Switch Target Portfolio Allocations

If the portfolio to be used for the client is the municipal bond version, but the client should not be using municipal bonds for a given bond class, this procedure will switch the target allocations to reflect the asset class codes and percentages from the taxable version of the portfolio.

For each asset class in the target portfolio, do the following:

Search the Equivalent Asset Class table for a match on Asset Class and Tax Status of NT (non-taxable).

IF a match is found

Check the Use Municipal Bond For flag which corresponds to the Bond Term of the matching entry (e.g. IF the Bond Term is ST (short term), check the Use Municipal Bonds For Short Term Bonds flag.)

IF there is a corresponding flag and the value is No

Search the Alternate Asset Class Table for a match on the asset class from the target portfolio to the Tax Exempt Bond Class

IF a match is found

Delete the asset class entry from the target portfolio

Add a new entry to the target portfolio for each entry in the Alternate Class Array of the matching Alternate Asset Class Table entry.

ELSE

go on to the next asset class in the target portfolio

END_IF

ELSE

go on to the next asset class in the target portfolio

END_IF

ELSE

go on to the next entry in the target portfolio

END_IF

- C. Determine Investments.doc - Auto Rebal Object - Determine How to Invest Proceeds From Asset Sales

Constants Needed By Module

Required Buy Variables - The count of variables which will always be present in a "buy" model. Current value is 5.

Required Buy Constraints - The count of constraint equations which will always be present in a "buy" model. Current value is 8.

Maximum Variables - The maximum number of variables which can be in the linear programming model with the current version of the LP processing engine. 16,000 for the industrial version of LINDO.

Maximum Constraints - The maximum number of constraint equations which can be in the linear programming model with the current version of the LP processing engine. 8,000 for the industrial version of LINDO.

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Work Fields For Module

This section identifies major work fields which are used in multiple routines within this portion of the Auto Rebal Object.

Asset Class Buy Control Table - This table is used to collect information regarding how buys are to be handled for a given asset class. There will be a maximum of one entry for each asset class in the target portfolio for which there is at least one non-zero adjusted buy variable. Each entry will contain the following data elements:

Asset Class - The asset class from the target portfolio. This is the asset class for which buy variables are defined.

Taxable Buy Amount - The total adjusted buy amounts for the asset class in taxable plans.

Tax Deferred Buy Amount - The total adjusted buy amounts for the asset class in tax deferred plans.

Split Taxable Buy Flag - Yes/No flag to indicate whether the buys in taxable accounts should be split between multiple funds.

Split Tax Deferred Buy Flag - Yes/No flag to indicate whether the buys in tax deferred accounts should be split between multiple funds.

Taxable Preferred Fund Found Flag - Yes/No flag to indicate whether a preferred fund(s) was found for use in the taxable accounts.

Tax Deferred Preferred Fund Found Flag - Yes/No flag to indicate whether a preferred fund(s) was found for use in the tax deferred accounts.

Taxable Preferred Fund Count - The number of preferred funds for the asset class for use in taxable accounts.

Tax Deferred Preferred Fund Count - The number of preferred funds for the asset class for use in tax deferred accounts.

Buy Amount Work Fields - The following fields are used for processing the buys within an asset class. There are nine occurrences of each field, to allow an asset class investment to be split between a maximum of nine funds. There are separate fields for taxable and tax deferred accounts to allow for different fund splits in the different tax status accounts. For most portfolios/asset classes, the investment split is done in the same manner for both taxable and tax deferred funds. For these situations, only the taxable fields will be used.

Taxable Split Amount - The amount to be bought in taxable accounts for split fund # (n).

Taxable Split Rate - The allocation rate for taxable accounts for split fund # (n). Maximum value is 1.00. Format is 9.99.

Taxable Fund # - The VGI fund to be used for split fund # (n).

Taxable Fund Holdings - The total existing taxable holdings in split fund (n) which have not been repositioned.

Tax Deferred Split Amount - The amount to be bought in tax deferred accounts for split fund # (n).

Tax Deferred Fund Holdings - The total existing tax deferred holdings in split fund (n) which have not been repositioned.

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Main Control

Execute Create Purchase Fund Lists

Execute Build Formulas For Buy Model

IF Status = SR

 Call LP processing engine with Model File as input

 IF LP processing engine status is successful

 Execute Determine Funds To Buy

 Execute Buy Fund Adjustments

 Execute Buy Cleanup

 END_IF

END_IF

Return to caller with status and output data.

Create Purchase Fund Lists

Get the preferred funds for the taxable plans.

Set up the data base keys to use:

 Business area will be based on the setting of m_BusinessArea

 Portfolio number will be the value from Portfolio Number

 Portfolio Tilt = value of m_PortfolioTilt

 Rank = preferred

 Bond Return Flag - set as follows:

 IF Use Muni Bonds For Long Term Bonds = yes or Use Muni Bonds for High Yield Bonds = Yes
 or Use Muni Bonds For Intermediate Term Bonds = Yes or Use Muni Bonds For Short
 Term Bonds = Yes

 Bond Return Flag = BO (both)

 ELSE

 Bond Return Flag = TX (taxable only)

 END_IF

 State = value from m_LegalResidenceState

Call stored procedure to Get Preferred and Alternate Funds

IF count of retrieved rows = 0

 IF Produce Explanation = yes

 Record the explanation "No preferred funds found for the portfolio"

 END_IF

ELSE

 For each row retrieved, perform Add A Fund List Entry

END_IF

Get the preferred funds for the tax deferred plans. (This only needs to be done when using the tax efficient portfolio.)

IF m_PortfolioTilt = TE (tax efficient)

Set up the data base keys to use:

Business area will be based on the setting of m_BusinessArea

Portfolio number will be the value from Portfolio Number

Portfolio Tilt = NO (core)

Rank = preferred

Bond Return Flag - set as follows:

IF Use Muni Bonds For Long Term Bonds = yes or Use Muni Bonds for High Yield Bonds =

Yes or Use Muni Bonds For Intermediate Term Bonds = Yes or Use Muni Bonds

For Short Term Bonds = Yes

Bond Return Flag = BO (both)

ELSE

Bond Return Flag = TX (taxable)

END_IF

State = value from m_LegalResidenceState

Call stored procedure Get Preferred Funds

IF count of retrieved entries = 0

IF Produce Explanations = yes

Record the explanation "No preferred funds found for the portfolio"

END_IF

ELSE

For each row retrieved, perform Add A Fund List Entry

END_IF

END_IF

Call the stored procedure to retrieve replacement funds. For each replacement fund, the fund id, VGI fund #, title, retail minimum, retirement minimum, and asset class breakdown will be returned. If the fund is not already in the set of purchase alternatives, add it. For new adds, the rank should be set to R, target asset class to spaces, split fund number = 0, and split fund percent = 1.00.

Add A Fund List Entry

Format an entry as follows:

Asset Class = Search Asset Class

Preferred/Alternate = Search Rank

Split Fund # = split fund # from the data base row

Split Fund Rate = investment rate from the data base row

VGI Fund Number = fund number from the data base row
 IF Search Rank = Preferred
 IF m_PortfolioTilt = TE (tax efficient)
 Add the formatted entry to the Fund List For Tax Efficient Portfolio.
 ELSE
 Add the formatted entry to the Primary Fund List.
 END_IF
 ELSE
 Add the formatted entry to the Primary Fund List.
 END_IF

Build Equations For Buy Model

Naming Conventions For Variables

C_{xx} - Current value of holdings in an asset class which are not being repositioned. xx is the asset class.

Bn_{xx} - An amount to be purchased in an asset class within a given plan. N is the plan # which identifies a specific plan. xx is the asset class.

H_{xx} - The total holdings in an asset class. This includes the current holdings in the asset class, plus any purchases in the asset class, plus the holdings in any child asset classes. xx is the asset class.

V_{xx_M} & V_{xx_P} - Plus and minus variances which, when added to and subtracted from the total holdings in the asset class, make the result equal to the target for that asset class. Two variables are used so that the variance amounts are always positive. Only one variance in a pair would be non-zero at a time. xx is the asset class.

assetvar - The sum of all V_{xx_M} and V_{xx_P} variables at the lowest level of the asset hierarchy.

SAAVar - The sum of the V_{xx_M} and V_{xx_P} variables for asset classes which are children of the IV class and are represented in the target portfolio (i.e. at least one of the target asset classes adds into the SAA asset class).

InterVar - The sum of the V_{xx_M} and V_{xx_P} variables for asset classes which are children of the SAA asset classes included in the SAAVar amount and are parents of other asset classes.

USStkVar - The sum of the V_{xx_M} and V_{xx_P} for the S2 and S3 asset classes. These asset classes make up the US stock amount for the target portfolio.

Bad_{xx} - The total purchases done for an asset class which are in plans which are not preferred selections for the asset class. The preferred plan is one that already has the asset class and is invested in the preferred or an alternate fund for that class. The "bad" plans are any plans which can purchase the asset class and don't own the preferred or alternate fund for the class. xx is the asset class.

AddPurch - The sum of the Bad_{xx} variables.

- Create a sequential file to hold the equations for the model. This file will be referred to as Model File in the remainder of this section.

- Write the following constant equations to Model File. These define the goal function and set up for the constraint equations which will follow.

Min assetvar+intervar+USstkvar+SAAvar+.05addpurch
subject to

- Create an additional purchase asset table to hold information on existing Vanguard accounts in preferred or alternate funds. Each entry should contain asset class code, taxable/non-taxable plan indicator, plan type, and to plan #. Go through the input assets and do the following:

IF asset class percent (1) for the asset = 100% *(only want assets that are not balanced funds)*
and the fund is a Vanguard fund
and current plan # is equal to Reposition To Plan # *(only want assets that are in a destination plan)*

Locate asset class (1) in target portfolio *(If the asset class for the asset is not included in rebalancing, find its first ancestor which is and use this class to check the target portfolio. This ancestor class would be the one added to the table if the class is in the target portfolio.)*

IF asset class is found in the target portfolio *(Asset class would be considered in the portfolio if it is an exact match to a target portfolio asset class or the asset class matches an alternate asset class entry for a tax exempt bond class which is in the target portfolio.)*

IF the asset is in a VGI annuity
or VGI fund # matches a preferred or alternate fund # ¹

Add the information for the asset to the table. (For alternate asset classes where the alternate classes are children of the class which is the taxable alternate to a non-taxable class, put the parent class, not the children into the list of classes to be purchased.)

END_IF

END_IF

END_IF

¹Either the Primary Fund List or Fund List For Tax Efficient Portfolio should be searched. Do the following to determine which list of funds to check for preferred or alternate funds:

IF m_PortfolioTilt = T (tax efficient) and the Plan is tax-deferred
use the Fund List For Tax Efficient Portfolio

ELSE

use the Primary Fund List

END_IF

- Create a table of accumulators for hold amounts and adjusted target amounts for each asset class included in rebalancing. Each table entry should have an asset class code, an adjusted target amount, and a hold amount. There should be one entry for each asset class code in the asset hierarchy ,

including all summary classes (IV included). The hold and adjusted target amounts should all be initialized to zero.

- Go through all input assets and add the hold amounts to the hold amounts in the table just created.

IF hold amount for the input asset > 0

Hold amount used = 0

For asset class (a) associated with the input asset for a=1 to a=n-1:

Compute work hold amount = hold amount (a) * asset class percent (a). The result is rounded to the nearest \$100 or \$1 depending on m_RoundingTo.

Locate asset class (a) in the accumulator table.

IF asset class (a) is found in the table

Add work hold amount to the hold amount for the corresponding table entry

ELSE

Locate asset class = IV in the accumulator table

Add work hold amount to the hold amount for the blank asset class table entry

END_IF

Add work hold amount to hold amount used.

For asset class (a) associated with the input asset for a=n:

Compute work hold amount = hold amount (a) - hold amount used.

Locate asset class (a) in the accumulator table.

IF asset class (a) is found in the table

Add work hold amount to the hold amount for the corresponding table entry

ELSE

Locate asset class = IV in the accumulator table

Add work hold amount to the hold amount for the IV table entry

END_IF

END_IF

- Summarize hold amounts in the table entries for all asset classes which are not included in rebalancing. Store summarized amounts at the first ancestor which is included in rebalancing.
- Develop the adjusted target amounts for each level of the asset hierarchy and update the table of adjusted target amounts.

Start at the bottom level of the hierarchy. If the asset class is not included in rebalancing, the target amount is zero. If the asset class is included in rebalancing and it is in the adjusted target portfolio, the target amount from the target portfolio is the target amount for the asset class. If the asset class is included in rebalancing but is not in the adjusted target portfolio, the target amount is zero.

For each level above the lowest level at which rebalancing begins, the adjusted target amount is the sum of the child asset class adjusted target amounts, plus any hold amount for that class. Work up the hierarchy until adjusted targets have been developed for all classes, up to IV. For the IV class, the adjusted target amount is the total portfolio value.

- For each entry in the accumulator table which is included in rebalancing, write an equation to Model File to identify the amount held in each asset class. This is the amount which is not being repositioned. Format the equation as $C_{xx} = \text{hold amount for the table entry}$ (where xx is the asset class for the table entry)

- Create a plan accumulator table with an entry for each destination plan in the current portfolio that has reposition to field equal to within plan. Each entry should contain a Plan # (multiple input plans may go to a single destination plan) and a buy amount. All the buy amounts should be initialized to zero.

- For each input asset, do the following:

Compute work buy amount = (current value of the input asset - hold amount for the input asset)

IF work buy amount > 0

Locate the Plan # in the plan accumulator table.²

Add work buy amount to buy amount in the corresponding table entry.

END_IF

² IF the asset belongs to a plan which has Reposition To Plan = "new plan", use the Reposition To Plan # to search the Plan Accumulator Table; otherwise, use the Plan #.

- Determine whether the number of equations needed for the model will be too large for LP processing engine.

Determine Asset Class Count, the number of asset classes in the asset hierarchy which are included in rebalancing.

Determine Target Portfolio Asset Class Count, the number of lowest level asset classes in the target portfolio.

Compute Estimated Variables, the estimated the number of variables in the model, as the sum of the following:

4 * Asset Class Count

Target Portfolio Asset Class Count * count of plans with buy amount > 0 and non-restricted investment options.

For each plan with restricted investment options, the number of investment options in the plan.

Sum of the number of alternate asset classes defined in all entries of the Alternate Class Array within the Alternate Asset Table * Number of non-taxable plans with buy amount > 0

Target Portfolio Asset Class Count

Required Buy Variables

Compute Estimated Constraints, the estimated number of constraints in the model, as the sum of the following:

Number of plans with buy amount > 0

3 * Asset Class Count

Target Portfolio Asset Class Count

Required Buy Constraints

of entries in the Alternate Asset Table

4 if there is one or more annuity plans with a buy amount > 0

1 if there is at least one Roth plan with a buy amount > 0

1 if there is at least one taxable plan with a buy amount > 0

IF Estimated Variables >= Maximum Variables
or Estimated Constraints >= Maximum Constraints
Set Status to BE and exit from this routine
END_IF

- Identify which asset classes should be used for purchases to achieve the desired preferred investments in the plan type. Since advice is given only on purchasing Vanguard funds, a list of asset classes to be used will be developed for Roth IRA's, annuities, and taxable accounts.

Total Roth Purchases = 0

Total Annuity Purchases = 0

Total Taxable Purchases = 0

Create a set of work variances from the adjusted target portfolio variances. Each variance included in the work variances should consist of the asset class and associated variance amount. A variance should only be included in the work variances if it is for one of the lowest level asset classes and the variance is negative (i.e. the class is under weighted). The work variance amount should be an unsigned amount.

Locate all plans in the plan accumulator table which have a plan type of Roth, VGI annuity, or are taxable. Add the buy amount from the table entry to the appropriate total purchases accumulator created above.

Using the Roth purchase hierarchy to define the order in which variances are evaluated, go through the list of work variances to determine the asset classes which should be used for purchases in Roth plans. Continue through the hierarchy until Total Roth Purchases amount is equal to zero. Keep track of the classes to be purchased in the Roth plan(s) and the amount to be purchased in the class.

If the asset class in the hierarchy is found in the target portfolio and the work variance amount > 0
 Search the Alternate Asset Class Table for a match on the asset class in the hierarchy to Tax Exempt Bond Class
 IF the asset class has a match on Tax Exempt Bond Class
 Add each of the asset classes in the Alternate Class Array to the list of asset classes to be used for Roth accounts
 Add work variance amount to Amount Moved To Taxable Class in the matching Alternate Asset Class Table entry
 ELSE
 Add the asset class to the list of asset classes to be used for Roth accounts
 END_IF
 IF Total Roth Purchases >= work variance amount
 Subtract work variance amount from Total Roth Purchases.
 Move zero to work variance amount.
 ELSE
 Subtract Total Roth Purchases from work variance amount.
 Move zero to Total Roth Purchases.
 END_IF
 ELSE
 Go on with the next asset class in the purchase hierarchy.
 END_IF

Repeat this same process for annuities and taxable accounts using the purchase amounts for those classes and creating a separate list of asset classes for each of the different types. On the taxable accounts, there would be no switch from a tax exempt asset class to a taxable asset class as is described for the Roth plan. This switch to taxable asset classes would occur for the annuity.

- The asset classes for non-zero work variances that remain will be allocated to tax deferred plans (retirement accounts). Replace any tax exempt asset classes with the alternate class. Do the following:

Go through the table of work variances. For each variance entry with a variance amount > 0, search the Alternate Asset Class Table for a match on the asset class for the variance to the Tax Exempt Bond Class.

IF there is a matching entry in the Alternate Asset Class Table
 Add the work variance amount to the Amount Moved To Taxable Class
 Move zero to work variance amount
 Add a new entry to the work variance table for each Asset Class in the Alternate Class Array.
 The work variance amount for these entries should be set to 1. (*Variance amount does not matter as long as it is greater than zero so that the class will be included for purchases.*)
 ELSE
 go on to the next variance entry in the table
 END_IF

- Build equations to identify the amount to be purchased in each asset class within a plan and limit these purchases to the amount available to spend within each plan. Assume that a purchase can be done in any of the lowest level asset classes within the target portfolio (not the adjusted target). Do the following for each plan in the plan accumulator table:

IF buy amount for the plan > 0

IF plan investment options are not restricted

Create an equation formatted as $Bpid_xx1+Bpid_xx2+Bpid_xx...=buy\ amount$ (where *pid* is the plan # and *xx* is a detail asset class. For Roth and taxable accounts, use the list of asset classes previously identified to be used for purchases in that account type. For other account types, use all work variance asset classes for which the corresponding work variance amount is > 0. There should be one entry for each of the asset classes within the list to be used for the plan type or that is a lowest level asset class in the target portfolio.)

ELSE

Create an equation formatted as

$Bpid_xx1+Bpid_xx2+Bpid_xx...+Bpid_M_nn1+Bpid_M_nn2+Bpid_M_nn...=buy\ amount$ (where *pid* is the plan #, *xx* is a detail asset class from the investments available to the plan, and *nn* is a restricted asset #. There should be one entry of the format *Bpid_xx* for each of the unique investment alternatives available to the plan which has a 100% allocation to an asset class and is an asset class that is included in rebalancing. If the asset class is not included in rebalancing, go up the asset hierarchy until an ancestor is located that is included in rebalancing; include this ancestor asset class in the formula. If there are two choices in the plan for an asset class, the asset class should be included in the equation only once. There should be one entry of the format *Bpid_M_nn* for each investment alternative in the plan where the asset class allocation is split between multiple classes. Do not include a multi-class fund in the formula if all the classes which comprise it are represented by single class/fund alternatives.)

END_IF

Write the equation to Model File.

END_IF

- If a class allocated to the Roth or taxable plans would appear in another type of plan and there is more than one asset class available to the plan, build a formula to require purchasing the amount allocated to the particular plan type. There would be at least one formula for each class that spans multiple plan types. Format the formula as $Bpid_xx+Bpid_xx...+Bpid_xx=a$ where *Bpid_xx* is a plan buy of the asset class for each of the plans of the type in which the amount should be controlled and *a* is the amount which should be purchased in the asset class within that plan type.

Example 1:

Plans 1 and 2 are Roth plans, plan 3 is a taxable plan, and plan 4 is an IRA. Asset classes have been split between the plans as follows:

Roth - SQ \$100, SK \$300

taxable - SK \$100, SW \$400

other - SW - \$100, BC \$500

Formulas to enforce the desired purchases would be:

$B1_SK + B2_SK = 300$

$B3_SK = 100$

$B3_SW = 400$

Example 2:

Plans 1 and 2 are Roth plans, plan 3 is a taxable plan, and plan 4 is an IRA. Asset classes have been split between the plans as follows:

Roth - SQ \$100,
taxable - SW \$100
other - SW \$300, SX \$200

No control formulas would be needed since the Roth and taxable plan types are only buying in a single asset class.

- o Annuity plans have restricted asset selections, so it is more difficult to control which classes are purchased in these plans. Formulas are needed to control the type of assets (type of assets) purchased in these plans, with the LP engine controlling the actual asset class selection from those available to the plan based on getting as close as possible to the targets.

Based on the asset classes and amounts which should be purchased in the annuity plan(s), determine the amount to be purchased in each of the SAA categories (stocks, bonds, and cash).

For each of these categories which is greater than zero, determine which asset class choices for the plan are descendants of the SAA. (A balanced fund may have portions in multiple SAA's.) For each of these categories which is greater than zero and for which selections were identified, build a formula formatted as $Bpid1_xx1 + Bpid1_xx2 + \dots Bpid1_xxn + Bpidn_xx1 + \dots Bpidn_xxn + \%Bpid1_M_1 + \dots \%Bpid1_M_n + \%Bpidn_M_1 + \dots Bpidn_M_n = Y$ (where $pid1 \dots n$ represents the plan number for each annuity plan, $xx1 \dots n$ represents each asset class purchased in an annuity plan which is a descendant of the category, and $\%Bpidn_M_1 \dots n$ represents a balanced asset for which part of the asset adds to the category. A balanced fund would only be included if part of it adds to the category and it was included in the original purchase formula for the plan. The % represents the portion of the asset which belongs in the category. Y = the total amount to be purchased in the annuity plans for the category.)

- o Adjust the adjusted target amounts developed for all asset classes within the hierarchy. Do the following for each entry in the Alternate Asset Class Table which has an Amount Moved To Taxable Class > 0:

Locate the Tax Exempt Bond Class in the table of asset classes and adjusted targets. Subtract Amount Moved To Taxable Class from the adjusted target amount.

IF the Alternate Class Count in the Alternate Asset Class Table entry is 1

Locate the Asset Class for the one entry in the Alternate Class Array within the table of asset classes and adjusted targets.

Add the Amount Moved To Taxable Class to the adjusted target amount

Go on to process the next entry in the Alternate Asset Class Table

ELSE

Desired Total Allocation = Amount Moved To Taxable Class

Set Amount Applied = 0

Set Adjustment Needed = 0

Add the Hold Amount for all asset class entries in the Alternate Asset Array to the Desired Total Allocation

Compute Maintain Percent = sum of the Asset Class Percents for all entries in the Alternate Asset Array

Repeat the following process until Desired Total Allocation = 0

For each Alternate Asset Array entry

Compute Adjustment Amount = [(Asset Class Percent / Maintain Percent) * Desired
 Total Allocation]. Round the amount based on m_RoundingTo.
 IF Adjustment Amount > (Desired Total Allocation - Amount Applied)
 Adjustment Amount = (Desired Total Allocation - Amount Applied)
 END_IF
 Add Adjustment Amount to Amount Applied
 IF Adjustment Amount < Hold Amount for the asset class
 Compute Adjustment Needed = Adjustment Needed + (Hold Amount - Adjustment
 Amount)
 Adjustment Amount = Hold Amount
 END_IF
 Locate Asset Class from the Alternate Asset Array entry in the table of asset classes and
 adjusted target amounts. Add Adjustment Amount to the adjusted target amount.
 Subtract Amount Applied from Desired Total Allocation
 Amount Applied = 0
 END_LOOP
 IF Adjustment Needed > 0
 Set Amount Applied = 0
 Repeat the following process until Adjustment Needed = 0
 For each Alternate Asset Array entry with Hold Amount < Adjusted Target Amount
 Compute Adjustment Amount = [(Asset Class Percent / Maintain Percent) *
 Adjustment Needed]. Round the amount based on m_RoundingTo.
 IF Adjustment Amount > (Adjustment Needed - Amount Applied)
 Adjustment Amount = (Adjustment Needed - Amount Applied)
 END_IF
 Locate Asset Class from the Alternate Asset Array entry in the table of asset classes
 and adjusted target amounts.
 IF (Adjusted Target Amount - Hold Amount) < Adjustment Amount
 Adjustment Amount = (Adjusted Target Amount - Hold Amount)
 END_IF
 Subtract Adjustment Amount from Adjusted Target Amount
 Add Adjustment Amount to Amount Applied
 Subtract Amount Applied from Adjustment Needed
 Amount Applied = 0
 END_LOOP
 END_IF
 Go on to process the next entry in the Alternate Asset Class Table
 END_IF

- Go through the asset hierarchy from top to bottom to build variance equations which limit the current holdings in an asset class, plus any buys in the asset class, to the adjusted target amount. Start at the IV level and do the following:

Identify all asset classes that are direct children of the current asset class.

IF current asset class = IV

 work target amount = total portfolio value

ELSE

 Locate the asset class in the table of asset classes and adjusted target amounts.

 IF the asset class is found

work target amount = adjusted target amount for the asset class
 ELSE
 work target amount = 0
 END_IF
 END_IF

If the asset class should be included in rebalancing, create an equation to get current holdings, holdings in child asset classes, and purchases to a single variable for the asset class. The equation should be formatted as

$C_{xx} + H_{yy1} + H_{yy2} + H_{yy...} + Bpid1_{xx1} + Bpid2_{xx} + Bpid..._{xx} + aBpid1_{M_nn1} + aBpid1_{M_nn2} + aBpid..._{M_nn...} - H_{xx} = 0$ (Where *xx* is the current asset class and *yy* is each of the asset classes which are direct children to the current asset class. *Pid* is a plan #. *a* is the allocation for the asset class participation in a "balanced fund" and *nn* is a restricted asset #. There should be one purchase of the format *Bpid_xx* for each plan with a buy amount greater than zero in which the current asset class can be purchased. For Roth, VGI annuities, and taxable accounts, use the list of asset classes to be used for the plan type to determine whether there can be a purchase for the plan. For all other account types, if the account type does not have restricted funds, the current asset class must be a work variance asset class for which the corresponding work variance amount is > 0. If the account type does have restricted funds, the current asset class must be in the list of available investments as an asset class that is a 100% component of the investment choice or be an ancestor of an investment which is allocated 100% to an asset class which is a descendant of the current asset class and is not included in rebalancing. For such an asset class, the current asset class must be the first ancestor which is included in rebalancing. There should be one or more purchases of the format *aBpid_M_nn* for each restricted investment plan with a buy amount > 0 and at least one asset comprised of multiple asset classes which has the current asset class as one of the component classes. There would be a separate entry for each of the multi-class assets in the plan which contains the current asset class. The allocation amount, *a*, would be the allocation within the asset that asset class contributes to the total investment choice-e.g. .1 for 10%. If a class within the allocation is not included in rebalancing, search up through the classes ancestors in the hierarchy until a class that is included in rebalancing is located.)

IF current asset class = IV

Create an equation formatted as $H_{xx} = \text{work target amount}$ (where *xx* = the current asset class)

Write the equation to Model File

ELSE

Create an equation formatted as $H_{xx} + V_{xx_M} - V_{xx_P} = \text{work target amount}$ (where *xx* = the current asset class)

Write the equation to Model File

END_IF

- Create an equation to get a single variance amount for all of the detail level variances which must be minimized. This equation should only contain asset classes in which purchases can occur - i.e. asset classes from the target portfolio.

Identify all lowest level asset classes within the target portfolio (not adjusted target).

Create an equation formatted as $V_{xx1_M} + V_{xx1_P} + V_{xx2_M} + V_{xx2_P} + V_{xx..._M} + V_{xx..._P} - \text{assetvar} = 0$ (Where *xx* is a detail asset class. There should be one set of minus and plus variances

for each of the lowest level asset classes within the target portfolio or which is an alternate to a non-taxable asset class within the target portfolio which was used for a purchase in a plan.)

Write the equation to Model File.

- Create an equation to get a single variance amount for all of the SAA variances which must be minimized. Do the following:

Locate all direct children of the IV asset class.

Create an equation formatted as $V_{xx1_M} + V_{xx1_P} + V_{xx2_M} + V_{xx2_P} + V_{xx..._M} + V_{xx..._P} - SAAvar = 0$ (Where *xx* is an asset class that is a child of IV. There should be one set of minus and plus variances for each of the SAA asset classes within the target portfolio.)

Write the equation to Model File.

- Create an equation to get a single variance amount for all of the intermediate variances which must be minimized. This set of variances is for the level directly below the SAA's. Do the following:

For each of the asset classes identified as SAA's in the target portfolio in the previous equation, locate the asset classes which are direct children of these classes.

Determine which of these children asset classes is in the target portfolio. That is, at least one of the lowest level asset classes summarizes to the asset class. If the asset class itself is a detail entry (e.g. the level below cash are detail entries), the asset class would not be selected for inclusion in the equation.

Create an equation formatted as $V_{xx1_M} + V_{xx1_P} + V_{xx2_M} + V_{xx2_P} + V_{xx..._M} + V_{xx..._P} - intervar = 0$ (Where *xx* is an asset class that is a child of an SAA and is in the target portfolio as a summary class, not a lowest level entry. There should be one set of minus and plus variances for each of the selected asset classes.)

Write the equation to Model File.

- Create an equation for the US stock variance amounts which must be minimized. Do the following:

Identify all asset classes in the asset hierarchy which are direct children of asset class SA.

Determine which of these children asset classes is in the target portfolio. That is, at least one of the lowest level asset classes summarizes to the asset class. If the asset class itself is a detail entry (e.g. the level below cash are detail entries), the asset class would not be selected for inclusion in the equation.

Create an equation formatted as $V_{xx1_M} + V_{xx1_P} + V_{xx2_M} + V_{xx2_P} + V_{xx..._M} + V_{xx..._P} - USstkvar = 0$ (Where *xx* is an asset class that is a child of an SAA and is in the target portfolio as a summary class, not a lowest level entry. There should be one set of minus and plus variances for each of the selected asset classes.)

Write the equation to Model File.

- Remove entries from the additional purchases asset table if there is no money to spend in the plan. Go through each asset in the additional purchases asset table and do the following:

Locate the plan # in the plan accumulator table.

IF the buy amount = 0

Delete the asset from the additional purchases asset table

END_IF

- Remove entries from the additional purchases table if the asset class should not be used for the plan. For each entry in the additional purchase asset table, do the following:

IF the plan is a Roth or VGI annuity

or the account type is taxable

IF the asset class is not in the list of asset types to be used for the plan

Delete the entry from the table

END_IF

ELSE

IF the asset class in the table entry is not in the list of work variance asset classes with a corresponding work variance amount greater than zero

Delete the entry from the table

END_IF

END_IF

- Create equations to encourage purchases in registrations which already contain preferred or alternate funds in asset classes for which purchases may be done.

Sort the additional purchase asset table by plan # within asset class.

For each unique asset class in the table, do the following:

Create a equation to encourage purchases in the plan which has an account in the asset class.

Format the equation as $Bpid1_xx + Bpid2_xx + Bpid..._xx - bad_xx = 0$ (where pid is the plan # for each plan in the plan accumulator table which has a buy amount > 0, a purchase for the asset class can be done in the plan, and and there is no entry in the additional purchase asset table for the asset class being processed. xx is the asset class being processed. A plan can purchase in an asset class if the plan is a Roth, VGI annuity, or taxable account and the asset class is included in the list of asset classes to be used for the plan. For other plan types (non-taxable accounts), any asset class in the additional purchase asset table could be purchased.)

Write the equation to Model File

Create an equation to summarize the "bad" purchase choices to a single variable. Format the equation as $bad_xx1 + bad_xx2 + bad_xx... - addpurch = 0$ (Where xx1 is an asset class. There should be one entry for each unique asset class in the additional purchase asset table.)

Write the equation to Model File

- Write the following statement to Model File:

END

- Close Model File
- Return to caller with successful completion status.

Determine Funds To Buy

For each plan that has a buy amount > 0, go through the output from LP processing engine and locate all the associated buy variables for that plan (Bpid_xx - where pid is the plan # and xx is an asset class to be purchased or Bpid_M_nn-where pid is the plan # and nn represents a specific asset available to the plan.) Do the following:

Adjust the non-zero buy variables for the plan.

Round all non-zero buy variables for the plan, except the last, up or down based on m_RoundingTo.

For the last non-zero buy variable for the plan, set the variable = (buy amount for the plan - the sum of all the rounded buy variables for the plan).

Perform Build Asset Class Buy Control Table

Go through each entry in the Asset Class Buy Control Table and do the following:

Perform Update Control Table With Fund Info

Perform Total Buy Amounts For The Asset Class

Go through all of the adjusted buy variables. Select variables with a name format of Bpid_xx (where pid is the plan # and xx is the asset class), the asset class matches asset class for the Asset Class Buy Control Table entry being processed, and the adjusted variable amount > 0. For each selected variable, do the following:

IF (m_PortfolioTilt = TE (tax efficient) and plan # is for a tax deferred plan

Perform Tax Efficient Tax Deferred Preferred Fund Additional Purchase

ELSE

Perform General Preferred Fund Additional Purchase

END_IF

Go through all of the adjusted buy variables. Select variables with a name format of Bpid_xx (where pid is the plan # and xx is the asset class), the asset class matches asset class for the Asset Class Buy Control Table entry being processed, and the adjusted variable amount > 0. For each selected variable, do the following:

IF (m_PortfolioTilt = TE (tax efficient) and plan # is for a tax deferred plan

Perform Tax Efficient Tax Deferred Alternate Fund Additional Purchase

ELSE

Perform General Alternate Fund Additional Purchase

END_IF

Go through all of the adjusted buy variables. Select variables with a name format of *Bpid_xx* (where *pid* is the plan # and *xx* is the asset class), the asset class matches asset class for the Asset Class Buy Control Table entry being processed, and the adjusted variable amount > 0. For each selected variable, do the following:

IF (m_PortfolioTilt = TE (tax efficient) and plan # is for a tax deferred plan

Perform Tax Efficient Tax Deferred Asset Class Buys

ELSE

Perform General Asset Class Buys

END_IF

Go through all adjusted buy variables. For each specific fund variable (name format is *Bpid_M_nn*) where adjusted variable amount > 0, do the following:

Set preferred fund number to use to the fund number value for asset nn in the restricted fund list for the plan

IF the fund number for asset nn is NULL (fund is not a Vanguard fund)

set preferred fund title to use to the title value for asset nn in the restricted fund list for the plan

ELSE

Locate preferred fund number to use in the Vanguard Fund List

IF the fund is found

set preferred fund title to use to the title for the matching entry in the Vanguard Fund List

ELSE

set preferred fund title to use to nulls

END_IF

END_IF

Go through the output Investments to determine if the preferred fund already exists in the plan. If fund number is not null, use that as the match criteria; otherwise, use fund title.

IF the preferred fund to use is already owned by the plan

Add the buy amount from adjusted buy variable to the Buy Amount for the output asset

Add the buy amount from adjusted buy variable to the Proposed Amount for the output asset

Move zero to the buy amount for the adjusted buy variable

ELSE

Plan # = pid from the buy variable name

Work asset class breakdown = asset class breakdown for asset nn (from the buy variable name) in the restricted fund list for plan # = pid from the buy variable name

Work buy amount = adjusted variable amount

Perform Add Fund To Output Assets

Adjusted variable amount = 0

END_IF

Build Asset Class Buy Control Table

Go through all adjusted buy variables and develop a list of unique asset classes for which a purchase is to be done. For each asset class in the list, do the following:

Initialize the table entry fields:

Asset Class = current asset class from the list of buys

All amounts and counts for the entry = 0

All flags for the entry = NO

Add the formatted entry to the Asset Class Buy Control Table

Update Control Table With Fund Info

Zero all occurrences of the Buy Amount Work Fields

Locate taxable funds for the asset class

IF m_PortfolioTilt = TE (tax efficient)

use Fund List For Tax Efficient Portfolio

ELSE

use Primary Fund List

END_IF

Search the fund list determined above to locate all entries with asset class = Asset Class and preferred/alternate flag = P

For each entry found, update the appropriate taxable split fields as follows:

IF Split Fund # for the returned entry = 0

Set indx = 1

ELSE

Set indx = Split Fund # for the returned entry

END_IF

Taxable Fund # (indx) = VGI Fund Number for the returned entry

Taxable Split Rate (indx) = Split Rate for the returned entry

IF number of entries returned > 0

Set Taxable Preferred Fund Found Flag to YES

Set Taxable Preferred Fund Count = number of entries returned

IF number of entries returned > 1

Set Split Taxable Buy Flag to YES

END_IF

END_IF

Locate tax exempt funds for the asset class. This is not done for all asset classes, only when taxable and tax exempt fund choices are different.

IF m_PortfolioTilt = TE (tax efficient)

Search the Primary Fund List to locate all entries with asset class = Asset Class and preferred/alternate flag = P

For each entry found, update the appropriate taxable split fields as follows:

IF Split Fund # for the returned entry = 0

Set indx = 1

ELSE

Set indx = Split Fund # for the returned entry

END_IF

Tax Exempt Fund # (indx) = VGI Fund Number for the returned entry

Tax Exempt Split Rate (indx) = Split Rate for the returned entry

IF number of entries returned > 0

Set Tax Exempt Preferred Fund Found Flag to YES

Set Tax Exempt Preferred Fund Count = number of entries returned

IF number of entries returned > 1

Set Split Tax Exempt Buy Flag to YES

END_IF

END_IF

END_IF

Total Buy Amounts For The Asset Class

Go through all adjusted buy variables with names formatted as Bpid_xx (where pid is the plan # and xx is the asset class). For each variable in which the asset class = Asset Class on the Asset Class Buy Control Table entry being processed, accumulate the adjusted buy amounts. (Amounts are only split between taxable and tax deferred if the investment choices are different. Otherwise, amounts are accumulated in the taxable field.)

Locate the output Investment Plan entry for the plan # (pid).

IF m_PortfolioTilt = TE (tax efficient)

IF the plan is a taxable plan

Add the adjusted buy amount to Taxable Buy Amount for the Asset Class Buy Control Table Entry

ELSE

Add the adjusted buy amount to Tax Deferred Buy Amount for the Asset Class Buy Control Table Entry

END_IF

ELSE

Add the adjusted buy amount to Taxable Buy Amount for the Asset Class Buy Control Table Entry

END_IF

IF Taxable Preferred Fund Found Flag = yes

IF Split Taxable Buy Flag for the Asset Class Buy Control Table entry = no

Taxable Split Amount (1) = Taxable Buy Amount for the table entry
 ELSE
 Perform Determine Taxable Split Amounts For The Asset Class
 END_IF
 ELSE
 Taxable Split Amount (1) = Taxable Buy Amount for the table entry
 Taxable Split Rate = 1.00
 END_IF

 IF m_PortfolioTilt = TE (tax efficient)
 (when taxable and tax deferred buys can be different, determine split amounts based on tax status for the plan)
 IF Tax Deferred Preferred Fund Flag = Yes
 IF Split Tax Deferred Buy Flag for the Asset Class Buy Control Table entry = NO
 Tax Deferred Split Amount (1) = Tax Deferred Buy Amount for the table entry
 ELSE
 Perform Determine Tax Deferred Split Amounts For The Asset Class
 END_IF
 ELSE
 Tax Deferred Split Amount (1) = Tax Deferred Buy Amount for the table entry
 Tax Deferred Split Rate (1) = 1.00
 END_IF
 END_IF

Determine Taxable Split Amounts For The Asset Class

For each non-zero Taxable Fund # in the Buy Amount Work Fields (indx = 1 to indx = 9), do the following:
 Go through all output Investment Assets
 IF VGI Fund # for the Investment Asset matches the Taxable Fund # (indx)
 Add Hold Amount for the Investment Asset to Taxable Fund Holdings (indx)
 END_IF
 Get Total Taxable Amount = [Taxable Buy Amount from the Asset Class Buy Control Table + sum of Taxable Fund Holdings (indx=1 to indx=9)]
 Adjustment Needed = 0
 Applied Amount = 0
 Processed Count = 0
 Go through all taxable Buy Amount Work Fields (indx = 1 to indx = 9). For each entry, do the following:
 IF Processed Count < (Taxable Preferred Fund Count - 1)
 Taxable Split Amount (indx) = [Total Taxable Amount * Taxable Split Rate(indx)]. Round the result based on m_RoundingTo.
 Add Taxable Split Amount (indx) to Applied Amount
 IF Taxable Split Amount (indx) < Taxable Fund Holdings (indx)
 Adjustment Needed = {Adjustment Needed + [Taxable Fund Holdings (indx) - Taxable Split Amount (indx)]}
 ENDIF

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Taxable Split Amount (indx) = [Taxable Fund Holdings (indx) - Taxable Split Amount
(indx)]
END_IF
ELSE
Taxable Split Amount (indx) = [Total Taxable Amount - Applied Amount]
IF Taxable Split Amount (indx) < Taxable Fund Holdings (indx)
Adjustment Needed = {Adjustment Needed + [Taxable Fund Holdings (indx) - Taxable Split
Amount (indx)]}
Taxable Split Amount (indx) = [Taxable Fund Holdings (indx) - Taxable Split Amount
(indx)]
END_IF
END_IF

IF Adjustment Needed > 0
Total Adjustable Rate = 0

Go through all taxable Buy Amount Work Fields (indx = 1 to indx = 9)
IF Taxable Split Amount (indx) > Taxable Fund Holdings (indx)
Add Taxable Split Rate (indx) to Total Adjustable Rate
END_IF

Repeat until Adjustment Needed = 0
Applied Amount = 0
Go through all taxable Buy Amount Work Fields (indx = 1 to indx = 9). For each occurrence, do
the following:

IF Taxable Split Amount (indx) > Taxable Fund Holdings (indx)
Compute Adjustment = [{Taxable Split Rate (indx) / Total Adjustable Rate} *
Adjustment Needed. Round Adjustment based on m_RoundingTo.
IF Adjustment > (Adjustment Needed - Applied Amount)
Adjustment = (Adjustment Needed - Applied Amount)
END_IF
IF Adjustment > [Taxable Split Amount (indx) - Taxable Fund Holdings (indx)]
Adjustment = [Taxable Split Amount (indx) - Taxable Fund Holdings (indx)]
END_IF
Taxable Split Amount (indx) = [Taxable Split Amount (indx) - Adjustment]
Add Adjustment to Applied Amount
END_IF
END_LOOP through Buy Amount Work Fields Adjustment Needed = [Adjustment Needed -
Applied Amount]
IF Applied Amount = 0
Repeat until Adjustment Needed = 0
Locate the largest Taxable Split Amount
IF Taxable Split Amount (indx) >= Adjustment Needed
Subtract Adjustment Needed from Taxable Split Amount (indx)
Adjustment Needed = 0
ELSE
Adjustment Needed = Adjustment Needed - Taxable Split Amount (indx)
Taxable Split Amount (indx) = 0
END_IF
```


END_REPEAT
END_IF
END_REPEAT
END_IF

Determine Tax Deferred Split Amounts For The Asset Class

For each non-zero Tax Deferred Fund # in the Buy Amount Work Fields (indx = 1 to indx = 9), do the following:

Go through all output Investment Assets

IF VGI Fund # for the Investment Asset matches the Tax Deferred Fund # (indx)

Add Hold Amount for the Investment Asset to Tax Deferred Fund Holdings (indx)

END_IF

Get Total Tax Deferred Amount = [Tax Deferred Buy Amount from the Asset Class Buy Control Table + sum of Tax Deferred Fund Holdings (indx=1 to indx=9)]

Adjustment Needed = 0

Applied Amount = 0

Processed Count = 0

Go through all tax deferred Buy Amount Work Fields (indx = 1 to indx = 9). For each entry, do the following:

IF Processed Count < (Tax Deferred Preferred Fund Count - 1)

Tax Deferred Split Amount (indx) = [Total Tax Deferred Amount * Tax Deferred Split Rate(indx)]. Round the result based on m_RoundingTo.

Add Tax Deferred Split Amount (indx) to Applied Amount

IF Tax Deferred Split Amount (indx) < Tax Deferred Fund Holdings (indx)

Adjustment Needed = {Adjustment Needed + [Tax Deferred Fund Holdings (indx) - Tax Deferred Split Amount (indx)]}

Tax Deferred Split Amount (indx) = [Tax Deferred Fund Holdings (indx) - Tax Deferred Split Amount (indx)]

END_IF

ELSE

Tax Deferred Split Amount (indx) = [Total Tax Deferred Amount - Applied Amount]

IF Tax Deferred Split Amount (indx) < Tax Deferred Fund Holdings (indx)

Adjustment Needed = {Adjustment Needed + [Tax Deferred Fund Holdings (indx) - Tax Deferred Split Amount (indx)]}

Tax Deferred Split Amount (indx) = [Tax Deferred Fund Holdings (indx) - Tax Deferred Split Amount (indx)]

END_IF

END_IF

IF Adjustment Needed > 0

Total Adjustable Rate = 0

Go through all tax deferred Buy Amount Work Fields (indx = 1 to indx = 9)

IF Tax Deferred Split Amount (indx) > Tax Deferred Fund Holdings (indx)

Add Tax Deferred Split Rate (indx) to Total Adjustable Rate

END_IF

Repeat until Adjustment Needed = 0

Applied Amount = 0

Go through all tax deferred Buy Amount Work Fields (indx = 1 to indx = 9). For each occurrence, do the following:

IF Tax Deferred Split Amount (indx) > Tax Deferred Fund Holdings (indx)

Compute Adjustment = [{Tax Deferred Split Rate (indx) / Total Adjustable Rate} *
Adjustment Needed. Round Adjustment based on m_RoundingTo.

IF Adjustment > (Adjustment Needed - Applied Amount)

Adjustment = (Adjustment Needed - Applied Amount)

END_IF

IF Adjustment > [Tax Deferred Split Amount (indx) - Tax Deferred Fund Holdings
(indx)]

Adjustment = [Tax Deferred Split Amount (indx) - Tax Deferred Fund Holdings
(indx)]

END_IF

Tax Deferred Split Amount (indx) = [Tax Deferred Split Amount (indx) - Adjustment]

Add Adjustment to Applied Amount

END_IF

END_LOOP through Buy Amount Work Fields Adjustment Needed = [Adjustment Needed -
Applied Amount]

IF Applied Amount = 0

Repeat until Adjustment Needed = 0

Locate the largest Tax Deferred Split Amount

IF Tax Deferred Split Amount (indx) >= Adjustment Needed

Subtract Adjustment Needed from Tax Deferred Split Amount (indx)

Adjustment Needed = 0

ELSE

Subtract Tax Deferred Split Amount (indx) from Adjustment Needed

Tax Deferred Split Amount (indx) = 0

END_IF

END_REPEAT

END_IF

Applied Amount = 0

END_REPEAT

END_IF

General Preferred Fund Additional Purchase

(This routine is used for any taxable asset class buys and tax deferred asset class buys for all portfolios except the tax efficient.)

IF Taxable Preferred Fund Found Flag = yes

(Try to buy an existing preferred fund)

Go through each of the taxable split occurrences (indx=1 to indx=9). For each occurrence, do the following:

IF Taxable Split Amount (indx) > 0

Search the output Investment Assets for a match with Plan # in the Investment Asset matches
pid from the variable name and VGI Fund # for the Investment Asset matches Taxable
Fund # (indx)

When a match is found

IF Taxable Split Amount (indx) >= adjusted variable amount

Add adjusted variable amount to Buy Amount for the selected Investment Asset

Add adjusted variable amount to Proposed Amount for the selected Investment Asset

Subtract adjusted variable amount from Taxable Split Amount (indx)

Move zero to adjusted variable amount

Processing of this buy variable is complete. Exit from this routine.

ELSE

Add Taxable Split Amount (indx) to Buy Amount for the selected Investment Asset

Add Taxable Split Amount (indx) to Proposed Amount for the selected Investment Asset

Subtract Taxable Split Amount (indx) from the adjusted variable amount

Move Zero to the Taxable Split Amount (indx)

Go on to next split amount

END_IF

END_IF

END_IF

General Alternate Fund Additional Purchase

(This routine is used for any taxable asset class buys and tax deferred asset class buys for all portfolios except the tax efficient.)

(Try to buy in existing alternate funds.)

IF Taxable Preferred Fund Found Flag = yes

Go through each of the taxable split variables (indx=1 to indx=9). For each occurrence, do the following :

IF Taxable Split Amount (indx) > 0

(Try to buy in an existing alternate fund for one of the breakdowns for the asset class.)

IF m_PortfolioTilt = TE (tax efficient)

use the Fund List For Tax Efficient Portfolio as the source of alternate funds

ELSE

use the Primary Fund List as the source for alternate funds

END_IF

Locate all entries on either the Primary Fund List or Fund List For Tax Efficient Portfolio (depending on result of check done above) with Asset Class = Asset Class for the current Asset Class Buy Control Table entry, Preferred/Alternate Flag = A, and Split Fund # = indx. For each selected entry, do the following:

Search the output Investment Assets for an entry with Plan # = pid from the variable name and VGI Fund # = VGI fund number from the selected alternate asset

When a match is found

IF Taxable Split Amount (indx) >= adjusted variable amount

Add adjusted variable amount to Buy Amount for the selected Investment Asset

Add adjusted variable amount to Proposed Amount for the selected Investment Asset

Subtract adjusted variable amount from Taxable Split Amount (indx)

Move zero to adjusted variable amount

Processing of this buy variable is complete. Exit from this routine.

ELSE

Add Taxable Split Amount (indx) to Buy Amount for the selected Investment Asset

Add Taxable Split Amount (indx) to Proposed Amount for the selected Investment Asset

Subtract Taxable Split Amount (indx) from the adjusted variable amount

Move Zero to the Taxable Split Amount (indx)

Go on to next split amount

END_IF

END_IF

END_IF

(All money for the buy variable was not used. Try to buy an existing alternate fund that covers the entire asset class.)

Locate all entries on either the Primary Fund List or Fund List For Tax Efficient Portfolio (depending on the check done above) with Asset Class = Asset Class for the current Asset Class Buy Control Table entry, Preferred/Alternate Flag = A, and Split Fund # = 0. For each selected entry, do the following:

Search the output Investment Assets for an entry with Plan # = pid from the variable name and VGI Fund # = VGI fund number from the selected alternate asset

When a match is found

Add adjusted variable amount to Buy Amount for the selected Investment Asset

Perform Apply Purchase To All Non-Zero Taxable Split Amounts

Processing of this buy variable is complete. Exit from this routine.

END_IF

General Asset Class Buys

(This routine is used for any taxable asset class buys and tax deferred asset class buys for all portfolios except the tax efficient.)

(Buy variable amount was not entirely spent on purchases of existing primary or alternate funds. Create new preferred fund investments.)

IF Taxable Preferred Fund Found

Search all occurrences of taxable split amounts (indx=1 to indx=9). For each occurrence, do the following:

IF Taxable Split Amount > 0 and (plan is not restricted or Taxable Fund # is in the list of investments available to the plan)

Preferred fund number to use = Taxable Fund # (indx)

IF Taxable Split Amount (indx) >= adjusted buy variable amount

Work buy amount = adjusted buy variable amount

ELSE

Work buy amount = Taxable Split Amount (indx)

END_IF

Plan # = pid from adjusted buy variable name

Perform Buy A Preferred Fund Subtract Work buy amount from Taxable Split Amount (indx)

Subtract Work buy amount from adjusted buy variable

IF adjusted buy variable = 0

Processing for buy variable is complete. Exit from this routine.
 ELSE
 Go on to process the next taxable split occurrence
 END_IF
 END_IF
 END_IF

(All of the buy amount was not used in a purchase of a preferred fund. If the plan is a restricted plan, try to buy an alternate fund.)

IF Taxable Preferred Fund Found and plan is restricted.

(Buy in specific alternate funds if they are available to the plan)

Search all occurrences of taxable split amounts (indx=1 to indx=9). For each occurrence, do the following:

IF Taxable Split Amount > 0

Locate all alternate funds on the Primary Fund List for the asset class. Look for entries with
 Asset Class = Asset Class, Preferred/Alternate Flag = A, Split Fund # = indx. For each
 located alternate fund, do the following:

IF the VGI fund number for the selected alternate is in the list of restricted assets

Preferred fund number to use = VGI Fund Number for the selected alternate

IF Taxable Split Amount (indx) >= adjusted buy variable amount

Work buy amount = adjusted buy variable amount

ELSE

Work buy amount = Tax Deferred Split Amount (indx)

END_IF

Work plan # = pid from adjusted buy variable

Perform Buy A Preferred Fund

Subtract Work buy amount from Taxable Split Amount (indx)

Subtract Work buy amount from adjusted buy variable

IF adjusted buy variable = 0

Processing for buy variable is complete. Exit from this routine.

ELSE

Go on to process the next tax deferred split occurrence

END_IF

END_IF

END_IF

(Buy in a non specific VGI alternate fund if one is available to the plan)

Locate all alternate funds on the Primary Fund List for the asset class. Look for entries with Asset
 Class = Asset Class, Preferred/Alternate Flag = A, Split Fund # = 0. For each located
 alternate fund, do the following:

IF the VGI fund number for the selected alternate is in the list of restricted assets

Preferred fund number to use = VGI fund number from the selected alternate

Work buy amount = adjusted buy variable amount

Work Plan # = pid of adjusted variable name

Perform Buy A Preferred Fund

Perform Apply Purchase To All Non-Zero Taxable Split Amounts

Processing of this buy variable is complete. Exit from this routine.

END_IF

(Buy in the first VGI fund for the class that is available to the plan. This is a non-specific buy.)
Go through all restricted assets available to the plan to locate an entry with VGI fund number not equal to nulls, (asset class (1) = Asset Class or is a child of Asset class), and asset class % (1) = 1.00.

IF an asset is selected

Preferred fund number to use = VGI fund number from the selected restricted asset
Work buy amount = adjusted buy variable amount
Work Plan # = pid from adjusted buy variable name
Perform Buy A Preferred Fund
Perform Apply Purchase To All Non-Zero Taxable Split Amounts
Processing of this buy variable is complete. Exit from this routine.

END_IF

(Buy in the first non-VGI fund for the class that is available to the plan. This is a non-specific buy.)

Go through all restricted assets available to the plan to locate an entry with VGI fund number equal to nulls, asset class (1) = Asset Class or is a child of Asset Class, and asset class % (1) = 1.00.

IF an asset is selected

Preferred fund number to use = nulls
Preferred fund title to use = Title for selected restricted asset
Work buy amount = adjusted buy variable amount
Work Plan # = pid from adjusted buy variable name
Work asset class breakdown = Asset Class Breakdown for the restricted asset
Perform Add Fund To Output Assets
Perform Apply Purchase To All Non-Zero Taxable Split Amounts
Processing of this buy variable is complete. Exit from this routine.

END_IF

END_IF

(If this section is reached, the buy amount could not be used in any of the preferred or alternate funds. This should not happen.)

IF plan is taxable

Preferred fund number to use = m_TaxAcctDCAFund

ELSE

Preferred fund number to use = m_TaxExmptDCAFund

END_IF

Plan id = pid from adjusted buy variable name

Work buy amount = adjusted variable amount

Perform Buy A Preferred Fund

IF Produce Explanations = yes

Record explanation "Purchase of nnnn for asset class xx in plan zzzzz was made to the money market because no preferred fund was identified for the asset class." (where nnnn is the adjusted variable amount, xx is the class from the variable name, and zzzzz is the plan name for the output Investment Plan with Plan # equal to pid from the variable name.)

END_IF
Subtract Work buy amount from Taxable Split Amount (1)
Subtract Work buy amount from adjusted buy variable
Processing for buy variable is complete. Exit from this routine.

Tax Efficient Tax Deferred Preferred Fund Additional Purchase

IF Tax Deferred Preferred Fund Found Flag = yes
(Try to buy an existing preferred fund)
Go through each of the tax deferred split occurrences (indx=1 to indx=9). For each occurrence, do the following:

IF Tax Deferred Split Amount (indx) > 0

Search the output Investment Assets for a match with Plan # in the Investment Asset matches
pid from the variable name and VGI Fund # for the Investment Asset matches Tax
Deferred Fund # (indx)

When a match is found

IF Tax Deferred Split Amount (indx) >= adjusted variable amount

Add adjusted variable amount to Buy Amount for the selected Investment Asset
Add adjusted variable amount to Proposed Amount for the selected Investment Asset
Subtract adjusted variable amount from Tax Deferred Split Amount (indx)
Move zero to adjusted variable amount
Processing of this buy variable is complete. Exit from this routine.

ELSE

Add Tax Deferred Split Amount (indx) to Buy Amount for the selected Investment
Asset
Add Tax Deferred Split Amount (indx) to Proposed Amount for the selected
Investment Asset
Subtract Tax Deferred Split Amount (indx) from the adjusted variable amount
Move Zero to the Tax Deferred Split Amount (indx)
Go on to next split amount

END_IF

END_IF

END_IF

Tax Efficient Tax Deferred Alternate Fund Additional Purchase

IF Tax Deferred Preferred Fund Found Flag = yes
(Try to buy in existing alternate funds.)

Go through each of the tax deferred split variables (indx=1 to indx=9). For each occurrence, do the following :

IF Tax Deferred Split Amount (indx) > 0

Locate all entries on the Primary Fund List with Asset Class = Asset Class for the current
Asset Class Buy Control Table entry, Preferred/Alternate Flag = A, and Split Fund # =
indx. For each selected entry, do the following:

00328625"060999
666090"9298360

ELSE

Work buy amount = Tax Deferred Split Amount (indx)

END_IF

Work Plan # = pid from adjusted variable name

Perform Buy A Preferred Fund

Subtract Work buy amount from Tax Deferred Split Amount (indx)

Subtract Work buy amount from adjusted buy variable

IF adjusted buy variable = 0

Processing for buy variable is complete. Exit from this routine.

ELSE

Go on to process the next tax deferred split occurrence

END_IF

END_IF

END_IF

(All of the buy amount was not used up in the purchase of existing or a new preferred fund. Should only be here for restricted plans.)

IF Tax Deferred Preferred Fund Found Flag = Yes and plan is restricted

(Buy in specific alternate funds if they are available to the plan)

Search all occurrences of tax deferred split amounts (indx=1 to indx=9). For each occurrence, do the following:

IF Tax Deferred Split Amount > 0

Locate all alternate funds on the Primary Fund List for the asset class. Look for entries with Asset Class = Asset Class, Preferred/Alternate Flag = A, Split Fund # = indx. For each located alternate fund, do the following:

IF the VGI fund number for the selected alternate is in the list of restricted assets

Preferred fund number to use = VGI Fund Number for the selected alternate)

IF Tax Deferred Split Amount (indx) >= adjusted buy variable amount

Work buy amount = adjusted buy variable amount

ELSE

Work buy amount = Tax Deferred Split Amount (indx)

END_IF

Work plan # = pid from adjusted buy variable

Perform Buy A Preferred FundSubtract Work buy amount from Tax Deferred Split Amount (indx)

Subtract Work buy amount from adjusted buy variable

IF adjusted buy variable = 0

Processing for buy variable is complete. Exit from this routine.

ELSE

Go on to process the next tax deferred split occurrence

END_IF

END_IF
END_IF
END_IF

IF plan is restricted(*Buy in a non specific VGI alternate fund if one is available to the plan*)
Locate all alternate funds on the Primary Fund List for the asset class. Look for entries with Asset
Class = Asset Class, Preferred/Alternate Flag = A, Split Fund # = 0. For each located alternate
fund, do the following:

IF the VGI fund number for the selected alternate is in the list of restricted assets
Preferred fund number to use = VGI fund number from the selected alternate
Work buy amount = adjusted buy variable amount
Work Plan # = pid of adjusted variable name

Perform Buy A Preferred FundPerform Apply Purchase To All Non-Zero Tax Deferred Split
Amounts

Processing of this buy variable is complete. Exit from this routine.

END_IF

(*Buy in the first VGI fund for the class that is available to the plan. This is a non-specific buy.*)
Go through all restricted assets available to the plan to locate an entry with VGI fund number not equal
to nulls, asset class (1) = Asset Class or is a child of Asset Class, and asset class % (1) = 1.00.

IF an asset is selected
Preferred fund number to use = VGI fund number from the selected restricted asset
Work buy amount = adjusted buy variable amount
Work Plan # = pid from adjusted buy variable name
Perform Buy A Preferred Fund
Perform Apply Purchase To All Non-Zero Tax Deferred Split Amounts
Processing of this buy variable is complete. Exit from this routine.

END_IF

(*Buy in the first non-VGI fund for the class that is available to the plan. This is a non-specific buy.*)
Go through all restricted assets available to the plan to locate an entry with VGI fund number not equal
to nulls, asset class (1) = Asset Class or is a child of the asset class, and asset class % (1) = 1.00.

IF an asset is selected
Preferred fund number to use = nulls
Preferred fund title to use = Title for selected restricted asset
Work buy amount = adjusted buy variable amount
Work Plan # = pid from adjusted buy variable name
Work asset class breakdown = asset class breakdown for the selected restricted asset
Perform Add Fund To Output Assets
Perform Apply Purchase To All Non-Zero Tax Deferred Split Amounts
Processing of this buy variable is complete. Exit from this routine.

END_IF

END_IF

(*should not happen since asset class would not have been a buy if there was no selection*)
Preferred fund number to use = m_TaxExmptDCAFund

Work buy amount = adjusted variable amount

Work Plan # = pid from adjusted buy variable name

Perform Buy A Preferred Fund

IF Produce Explanations = yes

Record explanation "Purchase of *nnnn* for asset class *xx* in plan *zzzzz* was made to the money market because no preferred fund was identified for the asset class." (*where nnnn is the adjusted variable amount, xx is the class from the variable name, and zzzz is the plan name for the output Investment Plan with Plan # equal to pid from the variable name.*)

END_IF

Perform Apply Purchase To All Non-Zero Tax Deferred Split Amounts

Subtract Work buy amount from adjusted buy variable

Processing for buy variable is complete. Exit from this routine.

Buy A Preferred Fund

Locate Preferred Fund Number To Use in Vanguard Fund List

IF fund is found

Preferred Fund Title To Use = fund title from the matching Vanguard Fund List entry

Work Asset Class Breakdown = asset class breakdown from the matching Vanguard Fund List entry

ELSE

Preferred Fund Title To Use = Nulls

Work asset class breakdown = spaces

Asset Class (1) of Work asset class breakdown = Asset Class being processed

Asset Class percent (1) of Work asset class breakdown = 1.00

END_IF

Perform Add Fund To Output Assets

Apply Purchase to All Non-Zero Tax Deferred Split Amounts

Repeat the following until adjusted variable amount = 0

Applied amount = 0

Compute total rates = sum of all Tax Deferred Split Rates for any entry where Tax Deferred Split Amount > 0

Go through each tax deferred split occurrence (indx=1 to indx=9). For each occurrence, do the following:

Compute adjustment = [(Tax Deferred Split Rate (indx) / total rates) * adjusted variable amount.

Round adjustment based on m_RoundingTo.

IF adjustment > (adjusted variable amount - applied amount)

adjustment = (adjusted variable amount - applied amount)

END_IF

IF adjustment > Tax Deferred Split Amount (indx)

adjustment = Tax Deferred Split Amount (indx)

END_IF

Subtract adjustment from Tax Deferred Split Amount (indx)

Add adjustment to applied amount

END_LOOP through Tax Deferred Split occurrences
 Subtract applied amount from adjusted variable amount
 IF Applied Amount = 0
 Repeat until Adjusted Variable Amount = 0
 Locate the largest Tax Deferred Split Amount
 IF Tax Deferred Split Amount (indx) >= Adjusted Variable Amount
 Subtract Adjusted Variable Amount from Tax Deferred Split Amount (indx)
 Adjusted Variable Amount = 0
 ELSE
 Subtract Tax Deferred Split Amount (indx) from Adjusted Variable Amount
 Tax Deferred Split Amount (indx) = 0
 END_IF
 END_REPEAT
 END_IF
 Applied amount = 0
 END_REPEAT

Apply Purchase to All Non-Zero Taxable Split Amounts

Repeat the following until adjusted variable amount = 0
 Applied amount = 0
 Compute total rates = sum of all Taxable Split Rates for any entry where Taxable Split Amount > 0
 Go through each taxable split occurrence (indx=1 to indx=9). For each occurrence, do the following:
 Compute adjustment = [(Taxable Split Rate (indx) / total rates) * adjusted variable amount.
 Round adjustment based on m_RoundingTo.
 IF adjustment > (adjusted variable amount - applied amount)
 adjustment = (adjusted variable amount - applied amount)
 END_IF
 IF adjustment > Taxable Split Amount (indx)
 adjustment = Taxable Split Amount (indx)
 END_IF
 Subtract adjustment from Taxable Split Amount (indx)
 Add adjustment to applied amount

END_LOOP through Taxable Split occurrences Subtract applied amount from adjusted variable amount
 IF Applied Amount = 0
 Repeat until Adjusted Variable Amount = 0
 Locate the largest Taxable Split Amount
 IF Taxable Split Amount (indx) >= Adjusted Variable Amount
 Subtract Adjusted Variable Amount from Taxable Split Amount (indx)
 Adjusted Variable Amount = 0
 ELSE
 Subtract Taxable Split Amount (indx) from Adjusted Variable Amount
 Taxable Split Amount (indx) = 0
 END_IF
 END_REPEAT

END_IF
Applied amount = 0
END_REPEAT

Buy Cleanup

Review all Output Investment Assets, doing the following:

IF Buy Amount > 0 and < Minimum Txn Amount

Add up all Buy Amounts for the plan

IF the total Buy Amounts for the plan < Minimum Txn Amount (*this should not happen unless the very small accounts have been marked as definitely repositionable*)

Go on to next Output Investment Asset

END_IF

Perform Develop Reallocation List

For each entry in the Reallocation List, Perform Reallocate Low Buy

IF Buy Amount for selected asset = 0 and Current Amount for selected asset = 0

Delete selected asset from the list of Output Investments

END_IF

END_IF

Review all Output Investment Assets, doing the following:

IF VGI Fund Flag indicates the fund is a Vanguard fund

and Proposed Amount > 0

and Buy Amount = Proposed Amount

and Proposed Amount < Fund Minimum Amount based on the type of plan (*tax exempt plans use retirement minimum, all others use retail minimum*)

IF the selected asset is the only buy for the plan

Go on to next Output Investment Asset

END_IF

Perform Develop Reallocation List

For each entry in the Reallocation List, Perform Reallocate Asset Class Buy

IF Buy Amount for selected asset = 0 and Current Amount for selected asset = 0

Delete selected asset from the list of Output Investments

END_IF

END_IF

Develop Reallocation List

Tot Amt To Reallocate = Buy amount for the selected asset

Amt Split = 0

Go through each used asset class (i.e. not nulls or spaces) in the asset class breakdown for the selected asset and create the Reallocation List. This list is a list of asset classes and associated portion of the selected buy amount which must be reallocated to another asset(s). For each asset class in the breakdown, do the following:

Compute Amt = (Tot Amt To Reallocate * Percent from the asset class breakdown entry being processed) rounded based on m_RoundingTo.
IF Amt > (Tot Amt To Reallocate - Amt Split)
 Amt = (Tot Amt To Reallocate - Amt Split)
END_IF
Add Amt to Amt Split
IF Amt > 0
 Add an entry to the Reallocation List containing the asset class from the breakdown entry being processed and amount = Amt
END_IF

IF Amt Split = 0 (should only happen if all calculated amounts end up rounding down to 0)
 Add an entry to the Reallocation List containing asset class (1) from the asset class breakdown and amount = Tot Amt To Reallocate
END_IF

Add Fund To Output Assets

Add 1 to Last Used Asset #

Add a new Investment Asset to the output. Asset # = Last Used Asset #, Plan # = Work asset class, asset class breakdown = work asset class breakdown, VGI Fund # = preferred fund number to use, VGI Fund Flag = "Vanguard fund", Title = preferred fund title to use, Current Amount = 0, Buy Amount = work buy amount, Sell Amount = 0, Proposed Amount = work buy amount, Tax Cost = 0, Fee Amount = 0

Reallocate Asset Class Buy

Adjustment Needed = Amount from Reallocation List Entry
Current Asset Class = Asset Class from Reallocation List Entry

(Look for an alternate purchase asset in the same asset class)

Search all assets associated with the plan to which the selected asset being reallocated belongs for any asset other than the selected asset which has asset class (1) = Current Asset Class and asset class percent (1) = 1.00 and Buy Amount > 0.

IF an alternate asset is found

 Add Adjustment Needed to Buy Amount for the alternate asset

 Add Adjustment Needed to Proposed Amount for the alternate asset

 IF Produce Explanations = Yes

 Record an explanation of "Buy amount of x in fund y for plan m was reallocated to z because the purchase is below the fund minimum." where x = Adjustment Needed, Y = title of the selected asset, m = plan name of the selected asset, and z = title of the alternate asset.

END_IF

Subtract Adjustment Needed from Buy Amount for the selected asset

Subtract Adjustment Needed from Proposed Amount for the selected asset

Processing for this Reallocation List Entry is complete

END_IF

(Look for alternate purchase assets in similar asset classes)

Repeat this process until Current Asset Class = IV *(will only happen if other purchases were to balanced funds)* or Adjustment Amount = 0 *(current Reallocation List Entry amount has been reallocated)*

Review the asset hierarchy to identify the parent asset class for the Current Asset Class

Review all assets within the plan other than the selected asset being reallocated

IF there are investments which are preferred or alternate fund selections in the plan which would sum to the parent asset class³ and have asset class percent (1) = 1.00

Create a list of the Investment Assets which meet this criteria (referred to later as Selected Alternative Assets). For each asset, include the Asset #, the first asset class *(assumes that all preferred and alternate funds are single asset class allocations)*, and a percent which is initialized to zero.

Perform Reallocate Buy

ELSE

Set Current Asset Class = parent asset class

END_IF

IF Adjustment Needed = 0

IF Produce Explanations = yes

Record an Explanation of "Buy amount of x in fund y for plan m was reallocated to z because the proposed amount is below the fund minimum." *where x is the Amount from the Reallocation List Entry, y is the name of the fund for the selected asset, m is the plan name for the plan, and z is a list of the fund names for the assets in the Selected Alternative Assets list.*

END_IF

Subtract Amount from Reallocation List Entry from Buy Amount for the selected asset

Subtract Amount from Reallocation List Entry from Proposed Amount for the selected asset

Processing for this Reallocation List Entry is complete

END_IF

³ IF selected asset is not in a restricted plan, IF m_PortfolioTilt is "tax efficient" and the plan is a taxable plan, use the Fund List For Tax Efficient Portfolio to determine the preferred and alternate funds; otherwise, use the Primary Fund List. IF the selected asset is in a restricted plan, any asset in the list of funds available to the plan is considered a preferred fund.

(No single asset class asset could be located to which the purchase can be reallocated. Try to locate a balanced fund which contains the asset class.)

Current Asset Class = Asset Class from Reallocation List Entry

Repeat this process until Current Asset Class = IV *(should not happen)* or Adjustment Amount = 0 *(current Reallocation List Entry amount has been reallocated)*

Review all assets within the plan other than the selected asset being reallocated

IF there are investments which (contain an asset class = current asset class or an asset class that would sum to current asset class) and are preferred or alternate fund selections in the plan (as defined for the last search)

Select the first asset found which meets the criteria as the alternate asset

Add Adjustment Needed to Buy Amount for the alternate asset

Add Adjustment Needed to Proposed Amount for the alternate asset

IF Produce Explanations = Yes

Record an explanation of "Buy amount of x in fund y for plan m was reallocated to z because the purchase is below the fund minimum." where x = Adjustment Needed, Y = title of the selected asset, m = plan name of the selected asset, and z = title of the alternate asset.

END_IF

Subtract Adjustment Needed from Buy Amount for the selected asset

Subtract Adjustment Needed from Proposed Amount for the selected asset

Processing for this Reallocation List Entry is complete

ELSE

Set Current Asset Class = parent asset class

END_IF

Reallocate Low Buy

Set Adjustment Needed = Amount for the Reallocation List entry

Set Current Asset Class = Asset Class of the Reallocation List entry

(Try to find another buy for a single asset class buy in either the same asset class or a similar asset class)

Repeat the following process until Current Asset Class = IV (will only happen if all other buys are to balanced funds) or Adjustment Amount = 0 (current buy has been reallocated)

Search the Output Investment Assets for another buy in the same plan as the selected asset with (asset class (1) = current asset class or in a class which sums to current asset class), Asset Class Percent (1) = 1.00, and Buy Amount > 0.

IF an alternate investment is found

Add Adjustment Needed to Buy Amount and Proposed Amount for the alternate asset

IF Produce Explanations = yes

Record an Explanation of "Buy amount of x in fund y for plan m was reallocated to z because the amount was less than the minimum transaction amount." where x is Adjustment Needed, y is the name of the fund for the selected asset, m is the plan name for the plan, and z is the name of the fund for the alternate Investment Asset.

END_IF

Subtract Adjustment Needed from Buy Amount for the selected asset

Subtract Adjustment Needed from Proposed Amount for the selected asset

Move zero to Adjustment Needed

Processing for this Reallocation List entry is complete

END_IF

Review the asset hierarchy to identify the parent asset class for the Current Asset Class

Set Current Asset Class = parent asset class

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Determine Investments.doc Determine Investments.doc

Auto Rebalancing Project

12/21/98

Linear Programming Version Of Auto Rebal Object

Auto Rebal Object - Determine How To Invest Proceeds From Asset Sales Page - 401

(Could not find a single asset class purchase for the same or related asset class. Look for a balanced fund purchase that contains the asset class or a related asset class.)

Set Current Asset Class = Asset Class of the Reallocation List entry

Repeat the following process until Current Asset Class = IV (should not happen) or Adjustment Amount = 0 (current buy has been reallocated)

Search the Output Investment Assets for another buy in the same plan as the selected asset with (any asset class in the asset class breakdown = current asset class or in a class which sums to current asset class) and Buy Amount > 0.

IF an alternate investment is found

Add Adjustment Needed to Buy Amount and Proposed Amount for the alternate asset

IF Produce Explanations = yes

Record an Explanation of "Buy amount of x in fund y for plan m was reallocated to z because the amount was less than the minimum transaction amount." where x is Adjustment Needed, y is the name of the fund for the selected asset, m is the plan name for the plan, and z is the name of the fund for the alternate Investment Asset.

END_IF

Subtract Adjustment Needed from Buy Amount for the selected asset

Subtract Adjustment Needed from Proposed Amount for the selected asset

Processing for this Reallocation List entry is complete

END_IF

Review the asset hierarchy to identify the parent asset class for the Current Asset Class

Set Current Asset Class = parent asset class

Reallocate Buy

Review the Selected Alternative Assets

IF there are multiple assets for a single asset class

IF the plan is not restricted and one of the assets is for a preferred fund⁴

Delete all the other assets for this asset class from the Selected Alternative Assets

ELSE

Delete all assets for the asset class except the one with the highest proposed amount

END_IF

END_IF

⁴ If $m_PortfolioTilt$ is "tax efficient" and the plan to which the asset being replaced belongs is taxable, use the Fund List For Tax Efficient Portfolio to determine preferred and alternate funds. Otherwise, use the Primary Fund List.

Assign a target percent for each of the Selected Alternative Assets. Go through each of the Selected Alternative Assets and do the following:

IF the asset class of the Selected Alternative Asset is in the target portfolio

Set percent for the current Selected Alternative Asset = target portfolio percent for the asset class

ELSE

Set percent for the current Selected Alternative Asset = 0

END_IF

When all of the Selected Alternative Assets have been reviewed, sum the assigned percents.

IF the sum of the assigned percents = 0

Count the number of Selected Alternative Assets

Set percent for each of the Selected Alternative Assets = 1/Count

ELSE

Delete any Selected Alternative Assets for which percent = 0

END_IF

Get Target Sum = sum of percents for the Selected Alternative Assets

Repeat this process until Adjustment Needed = 0

Adjustment Applied = 0

Go through each of the Selected Alternative Assets and do the following:

Compute Adjustment Amount = [(percent for the current Selected Alternative Asset / Target Sum) * Adjustment Needed] Round Adjustment Amount based on m_Rounding_To.

IF Adjustment Amount > (Adjustment Needed - Adjustment Applied)

Adjustment Amount = (Adjustment Needed - Adjustment Applied)

END_IF

Using the Asset # to located the Output Investment Asset, update the entry with the adjustment by adding Adjustment Amount to the Buy Amount for the asset.

Adjustment Applied = (Adjustment Applied + Adjustment Amount)

IF (Adjustment Needed - Adjustment Applied) = 0

Terminate loop through Selected Alternative Assets

END_IF

End_Loop through Selected Alternative Assets

Adjustment Needed = (Adjustment Needed - Adjustment Applied)

IF Adjustment Applied = 0

Locate the Selected Alternative Asset with the highest percent. If there are multiple entries with the same percent, select the first one.

Add Adjustment Needed to the Buy Amount for the asset

Adjustment Needed = 0

ELSE Adjustment Applied = 0

END_IF

END_LOOP for processing Adjustment Needed.

Buy Fund Adjustments

Perform International Fund Replacement

Perform Bond Index Fund Replacement

IF m_PortfolioTilt = NO (Core) or TE (Tax Efficient)

Perform Total Stock Market Replacement

END_IF

International Fund Replacement

IF S4 is in the target portfolio
and S5 is in the target portfolio

Compute new S4 amount = sum of all buys to asset class S4 where S4 is the only asset class for the investment and the investment is a new investment (current amount = 0) and the plan to which the asset belongs is either unrestricted or offers fund 113 as an option.

Compute new S5 amount = sum of all buys to asset class S5 where S5 is the only asset class for the investment and the investment is a new investment and the plan to which the asset belongs is either unrestricted or offers fund 113 as an option.

Compute current S4 amount = sum of all current amounts for asset class S4

Compute current S5 amount = sum of all current amounts for asset class S5

IF current S4 amount = 0 and current S5 amount = 0 and (new S4 amount > 0 or new S5 amount > 0)

Perform Total International Portfolio Substitution

Processing for this routine is complete

END_IF

IF new S4 amount = 0 or new S5 amount = 0

Switch to the substitute fund can not be done. Exit from this routine.

END_IF

IF (new S4 amount / new S5 amount) >= [(S4 percent in target portfolio / S5 percent in target portfolio) * (1 - m_TotalIntlPortfolioToleranceMinus)]

and (new S4 amount / new S5 amount) <= [(S4 percent in target portfolio / S5 percent in target portfolio) * (1 + m_TotalIntlPortfolioPlus)]

Perform Total International Portfolio Substitution

Processing for this routine is complete

END_IFEND_IF

Total International Portfolio Substitution

Set preferred fund number to use to 113

Locate 113 in the list of Vanguard Funds

IF 113 is found

Set preferred fund title to use to the fund title found in the list of Vanguard Funds

Set Work asset class breakdown to asset class breakdown for the matching entry in the Vanguard Fund list

ELSE

Set preferred fund title to use to nulls

Set Work asset class breakdown to spaces

Asset class (1) of Work asset class breakdown = S4

Asset class percent (1) of Work asset class breakdown = S4 percent in target portfolio

Asset class (2) of Work asset class breakdown = S5
Asset class percent (2) of Work asset class breakdown = S5 percent in target portfolio
END_IF

Go through all output Investment Assets and select assets with buy amount > 0, current amount = 0, (first asset class in asset class breakdown = S4 or S5) and first asset class percent in asset class breakdown = 1.00), and VGI fund number not equal to 113. For each selected asset, do the following:

IF plan is not restricted or 113 is in the list of restricted funds for the plan
Try to locate an asset entry for the fund 113 in the current plan
IF an existing entry for fund 113 was found in the plan
Add the buy amount for the selected asset to the buy amount for the existing fund 113 investment
Add the buy amount for the selected asset to the proposed amount for the existing fund 113 investment
Delete the selected asset from the output Investment Assets
ELSE
Set work buy amount to buy amount for the selected asset
Work Plan # = plan # from the selected Investment Asset Perform Add Fund To Output Assets
Perform Add Fund To Output Assets
Delete the selected asset from the output Investment Assets
END_IF

END_IF

Bond Index Fund Replacement

IF short term corp. bonds are in the target portfolio
and short term treasuries are in the target portfolio
Asset Class A = BC (short term corp)
Asset Class B = BT (short term treasuries)
Substitute Fund # = 132 (Short-term Bond Index)
Perform General Fund Replacement
END_IF

IF intermediate term corp. bonds are in the target portfolio
and intermediate term treasuries are in the target portfolio
Asset Class A = BO (intermediate term corp)
Asset Class B = BU (intermediate term treasuries)
Substitute Fund # = 314 (Intermediate-term Bond Index)
Perform General Fund Replacement
END_IF

IF long term corp. bonds are in the target portfolio
and long term treasuries are in the target portfolio
Asset Class A = BK (long term corp)
Asset Class B = BY (long term treasuries)
Substitute Fund # = 522 (Long-term Bond Index)
Perform General Fund Replacement
END_IF

General Fund Replacement

Locate the asset class breakdown data for the Substitute Fund #.

Set Percent A to the percent from the asset class breakdown for the Substitute Fund # for asset class A.

Set Percent B to the percent from the asset class breakdown for the Substitute Fund # for asset class A.

(If there is no percent available for either of the classes, fund replacement can not be done. Exit from this routine.)

Compute new A amount = sum of all buys to asset class A where A is the only asset class for the investment and the investment is a new investment (current amount = 0) and the plan to which the asset belongs is either unrestricted or offers substitute fund # as an option.

Compute new B amount = sum of all buys to asset class B where B is the only asset class for the investment and the investment is a new investment and the plan to which the asset belongs is either unrestricted or offers substitute fund # as an option.

Compute current A amount = sum of all current amounts for asset class A

Compute current B amount = sum of all current amounts for asset class B

IF current A amount = 0 and current B amount = 0 and (new A amount > 0 or new B amount > 0)

 A amount = new A amount

 B amount = new B amount

 Perform General Fund Substitution

 Processing for this routine is complete

END_IF

IF new A amount = 0 or new B amount = 0

 Switch to the substitute fund can not be done. Exit from this routine.

END_IF

IF current A amount > 0 and current B amount > 0

 Replacement can not be done. Exit from procedure.

END_IF

IF percent A <= percent B

 A amount = new A amount

 Total index amount = (A amount / A percent) rounded based on m_RoundingTo

 B amount = (Total index amount - A amount)

 IF B amount >= new B amount

 B amount = new B amount

 Total index amount = (B amount / B percent) rounded based on m_RoundingTo

 A amount = (Total index amount - B amount)

 IF A amount >= new A amount

 A amount = new A amount

 ELSE

 IF (new A amount - A amount) <= general retail fund minimum

 A amount = new A amount

 END_IF

 END_IF

ELSE

IF (new B amount - B amount) <= general retail fund minimum
 B amount = new B amount
 END_IF
 END_IFELSE
 B amount = new B amount
 Total index amount = (B amount / B percent) rounded based on m_RoundingTo
 A amount = (Total index amount - B amount)
 IF A amount >= new A amount
 A amount = new A amount
 Total index amount = (A amount / A percent) rounded based on m_RoundingTo
 B amount = (Total index amount - A amount)
 IF B amount >= new B amount
 B amount = new B amount
 ELSE
 IF (new B amount - B amount) <= general retail fund minimum
 B amount = new B amount
 END_IF
 END_IF
 ELSE
 IF (new A amount - A amount) <= general retail fund minimum
 A amount = new A amount
 END_IF
 END_IF
 END_IF
 IF A amount > 0 and B amount > 0
 IF {[(new A amount - A amount) = 0 and current A amount = 0]
 or [(new B amount - B amount) = 0 and current B amount = 0]}
 Perform General Fund Substitution
 Processing for this routine is complete
 END_IF
 END_IF

General Fund Substitution

Set preferred fund number to use to substitute fund #
 Locate the substitute fund # in the list of Vanguard Funds
 IF the substitute fund # is found
 Set preferred fund title to use to the fund title found in the list of Vanguard Funds
 Set Work asset class breakdown to asset class breakdown for the matching entry in the Vanguard Fund list
 ELSE
 Set preferred fund title to use to nulls
 Set Work asset class breakdown to spaces
 Asset class (1) of Work asset class breakdown = Asset Class A
 Asset class percent (1) of Work asset class breakdown = A Percent
 Asset class (2) of Work asset class breakdown = Asset Class B
 Asset class percent (2) of Work asset class breakdown = B Percent

END_IF

Go through all output Investment Assets and select assets with buy amount > 0 (first asset class in asset class breakdown = Asset Class A or Asset Class B) and first asset class percent in asset class breakdown = 1.00), and VGI fund number not equal to substitute fund #. Process assets which have current amount = 0 first. For each selected asset, do the following:

IF plan is not restricted or substitute fund # is in the list of restricted funds for the plan

IF the selected asset is for asset class A

IF A amount = 0

Work buy amount = 0

ELSE

IF buy amount for the selected asset <= A amount

or (buy amount for the selected asset - A amount) <= fund minimum (check either the retail or retirement minimum depending on the plan type)

Work buy amount = buy amount for the selected asset

ELSE

Work buy amount = A amount

END_IF

IF Work Buy Amount <= A Amount

Subtract Work buy amount from A amount

ELSE

A amount = 0

END_IF

END_IF

ELSE

IF B amount = 0

Work buy amount = 0

ELSE

IF buy amount for the selected asset <= B amount

or (buy amount for the selected asset - B amount) <= fund minimum (check either the retail or retirement minimum depending on the plan type)

Work buy amount = buy amount for the selected asset

ELSE

Work buy amount = B amount

END_IF

IF Work Buy Amount <= B Amount

Subtract Work buy amount from B amount

ELSE

B amount = 0

END_IF

END_IF

END_IF

IF Work buy amount > 0

Try to locate an asset entry for the substitute fund # in the current plan

IF an existing entry for the substitute fund # was found in the plan

Add the Work buy amount to the buy amount for the existing substitute fund # investment

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Add the Work buy amount to the proposed amount for the existing substitute fund
investment

ELSE

Work Plan # = plan # from the selected Investment Asset Perform Add Fund To Output
Assets

Perform Add Fund To Output Assets

END_IF

Subtract Work buy amount from the buy amount for the selected asset

Subtract Work buy amount from the proposed amount for the selected asset

IF proposed amount for the selected asset = 0

Delete the selected asset from the Output Assets

END_IF

END_IF

END_IF

Total Stock Market Replacement

Compute new SQ amount = sum of all buys to asset class SQ where SQ is the only asset class for the investment and the purchase is a new buy (current amount = 0) and the plan to which the asset belongs is either unrestricted or offers fund 85 or 102 as an option.

Compute new SX amount = sum of all buys to asset class SX where SX is the only asset class for the investment or all asset classes in the investment are descendants of SX and the purchase is a new buy (current amount = 0) and the plan to which the asset belongs is either unrestricted or offers fund 85 or 102 as an option.

IF new SQ amount = 0 or new SX amount = 0

No switch can be done. Exit from this routine.

END_IF

IF m_PortfolioTilt = TE (tax efficient)

Compute TMSP amount = sum of all proposed amounts in fund 85 (TSMP) in taxable plans

Compute Cap Appreciation Amount = sum of all proposed amounts in fund (102) in taxable plans

Compute new SQ amount = (new SQ amount + TSMP amount + Cap Appreciation Amount)

END_IF

IF (new SQ amount / new SX amount) > [(target SQ allocation rate / target SX allocation rate) * (1 - m_TSMPortfolioToleranceMinus)]

and (new SQ amount / new SX amount) < [(target SQ allocation rate / target SX allocation rate) * (1 + m_TSMPortfolioTolerancePlus)]

Perform Switch To Total Stock Market Portfolio

Processing for this routine is complete

END_IF

Switch To Total Stock Market Portfolio

General TSMP Switch

Set preferred fund number to use to 85 (TSMP-Total Stock Market Portfolio)

Locate preferred fund number to use in the list of Vanguard Funds

IF preferred fund number to use is found

Set preferred fund title to use to the fund title found in the list of Vanguard Funds

Set Work asset class breakdown to the asset class breakdown for the entry in the list of Vanguard Funds

ELSE

Set preferred fund title to use to nulls

Set Work asset class breakdown to spaces

Set asset class (1) of Work asset class breakdown to S6

Set asset class percent (1) to 1.00

END_IF

Go through all output Investment Assets. Select an asset if buy amount > 0, [{(first asset class in asset class breakdown = SQ or SX) and first asset class percent in asset class breakdown = 1.00} or all asset classes in the investment are descendants of SX], and VGI Fund # not equal to 85 or 102). For each selected asset, do the following:

IF plan is unrestricted or fund 85 is in the list of restricted investments for the plan

Try to locate an asset entry for fund 85 in the current plan

IF existing TSMP was found in the plan

Add the buy amount for the selected asset to the buy amount for the existing TSMP investment

Add the buy amount for the selected asset to the proposed amount for the existing TSMP investment

Subtract Buy Amount for the selected asset from Proposed Amount for the selected asset

IF Current Amount for the selected asset = 0 and Proposed Amount for the selected asset = 0

Delete the selected asset from the output Investment Assets

END_IF

Go on to processing the next output Investment Asset

END_IF

END_IF

IF plan is unrestricted or fund 102 is in the list of restricted funds for the plan

Try to locate an asset entry for fund 102 in the current plan

IF existing Tax Managed Cap Appreciation was found in the plan

Add the buy amount for the selected asset to the buy amount for the existing investment

Add the buy amount for the selected asset to the proposed amount for the existing investment

Subtract Buy Amount for the selected asset from Proposed Amount for the selected asset

IF Current Amount for the selected asset = 0 and Proposed Amount for the selected asset = 0

Delete the selected asset from the output Investment Assets

END_IF

Go on to processing the next output Investment Asset

END_IF

END_IF

IF plan is unrestricted or fund 85 is in the list of restricted funds for the plan

Set work buy amount to buy amount for the selected asset
Perform Add Fund To Output Assets
Subtract Buy Amount for the selected asset from Proposed Amount for the selected asset
IF Current Amount for the selected asset = 0 and Proposed Amount for the selected asset = 0
Delete the selected asset from the output Investment Assets
END_IF
END_IF

IF fund 102 is in the list of restricted funds for the plan
Set preferred fund number to use to 102 (Tax Managed Cap Appreciation)
Locate preferred fund number to use in the list of Vanguard Funds

IF preferred fund number to use is found
Set preferred fund title to use to the fund title found in the list of Vanguard Funds
Set Work asset class breakdown to the asset class breakdown for the entry in the list of Vanguard Funds

ELSE
Set preferred fund title to use to nulls
Set Work asset class breakdown to spaces
Asset class (1) of Work asset class breakdown to SQ
Asset class percent (1) of Work asset class breakdown = $(SQ \text{ target allocation} / [SX \text{ target allocation} + SQ \text{ target allocation}])$
Asset class (2) of Work asset class breakdown = SX
Asset class percent (2) of Work asset class breakdown = $(SX \text{ target allocation} / [SX \text{ target allocation} + SQ \text{ target allocation}])$

END_IF
Set work buy amount to buy amount for the selected asset
Perform Add Fund To Output Assets
Subtract Buy Amount for the selected asset from Proposed Amount for the selected asset
IF Current Amount for the selected asset = 0 and Proposed Amount for the selected asset = 0
Delete the selected asset from the output Investment Assets
END_IF
END_IF

What is claimed is: